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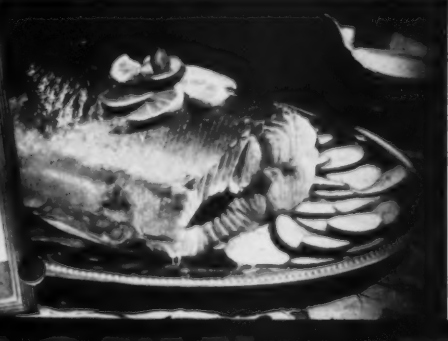

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A JOURNAL DEVOTED TO THE PRODUCTION AND MANUFACTURE OF ALL EDIBLE COMMODITIES INVOLVING A PROCESS OF MANUFACTURE.

FOOD MANUFACTURE

Incorporating Canning, Packing and Preserving.

VOLUME . . . XV

NUMBER . . . 3

MARCH 1, 1940

Cold Storage Number

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Published on the first Friday of every month by Leonard Hill Limited, 17, Stratford Place, London, W. 1. Telephone: Mayfair 7383 (Private Branch Exchange). Annual Subscription, 10s.; Abroad, 12s. 6d.; Single copies, 1s.

The Editor will be glad to consider contributions from those engaged in the Food Industry. Articles intended for publication should be of a practical nature and accompanied by photographs or drawings when possible.

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Facing first page of Editorial

FOOD MANUFACTURE

Vol. XV, No. 3 March 1, 1940

Quick Freezing

SIR HENRY L. FRENCH'S speech at the luncheon given by the British Association of Refrigeration has already been referred to by FOOD MANUFACTURE. Among the other speakers on this occasion was Mr. D. Robertson, M.P., who dealt with the position of refrigeration in connection with the fish industry. He recalled how the great salted herring trade with Russia which existed before the war of 1914 had now virtually disappeared. He suggested that the engineering side of the industry might provide mobile refrigerating plants in order that herrings in the glut season could be distributed to various centres throughout the country and kept there at suitable temperature, thereby making herrings available all the year round, thus obviating the lamentable necessity for importing herrings from Norway and for using valuable currency to pay for them.

Mr. Robertson also stated that quick freezing was a means of combating over-fishing in the deep-sea fisheries. Going out and getting a large catch and selling it for as high a price as possible all at once was wrong. Again, the economic side of long-distance fishing was a very serious matter, and in his view smaller boats with smaller catches and the adoption of quick freezing would soon bring about a great improvement.

Synthetic Resin Containers

One of the recent spectacular achievements of the synthetic resin industry was the production of a resin which could be spun into filaments finer than those of natural silk and many times stronger. This type of resin, familiarly known as polyamide resin, was created in the research laboratories of the du Pont concern in the United States after many years of patient application. According to the latest issue to hand of *Kunststoff-Technik* (December, 1939), the German plastics industry is now exploring the possibilities of polyamide resin with a view to the production of transparent glass-like containers.

From the standpoint of the food industry, such a development would undoubtedly present many features of interest since none of the existing plastic materials has been seriously put forward as a substitute for glass or tin in food-container manufacture. The polyamide resin merits more serious consideration for this purpose because it is non-toxic, is not attacked by ordinary liquids (including oils and fats) even at relatively high temperatures and has a much higher melting point than previous thermoplastic materials. Its mechanical strength is exceptionally high (bending strength over 1,000 kg/cm.^{2} and impact bending strength over 150 cm. kg/cm.^{2}). It is claimed that the melting point of about 250° C. permits of sterilisation of polyamide resin containers at the usual temperatures, while sealing is easily effected by welding.

Large-size containers of polyamide resins do not appear to have reached the German market as yet in view of the difficulty in moulding the resin except by the injection moulding technique, which is only applicable to comparatively small objects. Developments in this field will nevertheless be worthy of continued attention.

Fishiness in Butter

Organic nitrogenous compounds, notably trimethylamine, have long been regarded as responsible—in part at least—for the fishy taste of aged butter. In recent years doubts have been cast upon the correctness of this supposition; for example, by Täufel (*Fette und Seifen*, 1937, 179), and by Davies and Gill (*J. Soc. Chem. Ind.*, 1936, 141T). The last-named workers did consider, however, that the fishiness resulted from certain conversion products of trimethylamine.

It is fairly certain that traces of iron and copper favour the development of a fishy odour in butter,

and manganese must also be included among the metals promoting fishiness in the light of the recent investigations of Mohr and Arbes (*Fette und Seifen*, November, 1939, 678). On the trimethylamine question, these workers likewise failed to obtain positive proof of its presence in fishy butter, while the possibility of conversion of this amine into more complex bodies is brought into question by the fact that they were later able to detect its presence after it had been added to fresh butter. The responsibility for the fishy odour is ascribed by them to the presence of "a hitherto unknown breakdown or intermediate product of diacetyl, possibly in association with fatty acid or protein breakdown products".

Nutrition to the Fore

We have been familiar with the persistent attacks on white bread launched by the daily Press for many years. Since the outbreak of war the campaign has been renewed, and *The Times* and *Daily Telegraph* have given the subject much space. Our leading dietitians believe that many of the present-day internal troubles are due to a deficiency of vitamins B_1 and B_2 brought about by the use of roller-milled flour. The position is regarded as sufficiently important to warrant the attention of a special Parliamentary and Scientific Committee of the House of Commons, which has already consulted experts on the nutritive value of bread. Undoubtedly the claims of the dietitians must be considered seriously and, if need be, the vitamin B content of white bread brought up to that of the whole grain. The general public demands white bread and will not have wholemeal, and the problem therefore resolves itself into bringing up the vitamin content of white flour without injuring the colour or texture.

A New Whole Meal Process

Recently a new process for manufacturing wholemeal has created some interest both in the lay press and the milling journals. Messrs. W. and G. Clark have invented a machine in which wheat grains are disintegrated by an intense air pressure. The meal obtained is very fine and has a moisture of about 8 per cent. It carries the large amount of 25 gallons water per sack of 280 lb., and the loaf is said to be palatable. The meal is fermented on a cool process from 72° to 74° F. for from ½ hour to ¾ hour and then tinned as usual. The meal produces a loaf of normal volume, has a crumb which cuts well, and a full, sweet flavour. It is very moist in the crumb, and the moisture content of the finished bread is about 1½ per cent. greater than average wholemeal bread. The process is not, however, quite so new as the daily Press would have us believe. We are informed that Mr. W. Clark had this meal on the market in Hull over six years ago, and, interesting though the process is, we do not agree with Mr. J. Wright that "this new process is comparable in importance with the discovery of electricity".

Meat Products

The Ministry of Food has issued a notice with regard to the position of the manufacturers of meat products in connection with meat control. Manufacturers of sausages, pies, brawn, etc., are divided into three groups for the purpose of obtaining supplies of meat for manufacturing purposes, and no manufacturer may be included in more than one group. The first includes those who had a peacetime consumption of half a ton and over of raw meat a week. Group 2 includes all butchers and caterers and institutions who purchase by wholesale. The third group includes all other meat manufacturers. The number of meat products which may be made will not be limited prior to the rationing of meat, but with the institution of rationing the Director of Meat Manufacturers will make arrangements with the Area Wholesale Meat Supply Association to ensure the provision of adequate supplies.

Quality of Kippers

Some very useful work has been done by J. A. Lovern and G. A. Reay on the effects of the composition of the fresh herring and variations in the process of kippering. The fatter a kipper the more palatable it is. Kippers made from herring from February to early May contain less than 8 per cent. of fat, whereas there is an abrupt rise in fat content in June—often from 2 per cent. to over 20 per cent. This newly acquired fat, however, is apparently held very loosely and runs away readily in the kiln, the fish consequently being very soft and easily torn. By July the consolidation of the fat has taken place and the fish makes excellent kippers. The great variation in the composition of the herring makes it impossible to avoid great variation in the quality of kippers, even should the process of kippering be rigidly standardised.

In kippering, not only are the fish dried, but the smoke imparts colour, odour and flavour to them. The use of dye masks the effect of smoking, so that the "point of finish" has to be judged mainly from the feel or texture of the kipper. Loss of

weight in the kiln is almost wholly accounted for by loss of water, little fat being lost, except in the case of early June fish. The relation between "point of finish" as judged by "feel" and the loss of moisture was determined with the assistance of trade experts, and it was found that fish that had reached a "point of finish" had lost from 15 to 25 per cent. of their weight.

Timber Supplies

It's an old saying that we never miss the water till the well runs dry, and a number of food manufacturers are noting with surprise how much wood they used in peace times. In the normal way of things one would scarcely see much connection between a baker and a timber importer, and yet there is a tremendous link, as present-day conditions are showing. The Controller of Timber Supplies has appealed to the baking trade, as well as to other food industries, to exercise the greatest economy in the use of soft wood. In peace times many containers made of soft wood become firewood after being once used. These should now be used over and over again. Much of this wood came from Finland, whose sons are now engaged on a very different job from chopping down trees, and it behoves everyone in the food industries to economise most stringently in the use of timber.

Sugar for Confectionery

The rationing of sugar for manufacturing purposes did not come as a complete surprise to the industry. After the rationing for household purposes it was inevitable. The surprise was that the reduction was 40 per cent. It is impossible to spread this amount so as to produce 100 per cent. of turnover, and now the major problem of manufacturers is to discover the best way to use the allotted amount. There is no restriction as to what articles can be made—a baker can use up all his sugar supplies on one fancy line, but if he is wise he will spread it about. At present fondant is not rationed, but as the manufacturers of fondant are rationed obviously supplies will be less. Syrup, honey and glucose are not restricted and can find some place in manufacture. The best way is to reduce the amount of sugar in every article made. A reduction of 2 oz. in every pound of sugar used will not materially affect any process or product, and yet there is a saving of 12½ per cent. right away. Luxury articles which require a lot of sugar should be dropped. Chocolate creams might have more chocolate and less sickly filling. Doubtless the ingenuity of the bakers and confectioners will soon overcome the difficulties caused by the 40 per cent. cut in their sugar supplies.

Agricultural Security

The Minister of Agriculture faced the music a few weeks ago when he met a thousand Norfolk farmers at Norwich and explained his views on home food production. In his opinion agriculturalists are seeking security, not so much for themselves as for their land, and he hopes that the Government will not allow a catastrophe similar to the one after the last war. The main difficulty is to arrive at a level of prices that will inspire confidence in the minds of farmers and enable them to earn enough to carry on. Control is a necessary wartime evil, but prices can be adjusted in the future in the light of experience, if only a spirit of mutual help and co-operation can be fostered. Everyone agrees as to the importance of home food production, particularly if it is the right sort of production, and help and encouragement should be given to farmers, and we believe that a feeling of security would be the greatest help that could be given.

Suspension of the Quota

The Government propose to suspend the Wheat Quota for the duration of the war, and probably for a period thereafter, not exceeding two years. This policy is embodied in the Agricultural (Miscellaneous War Provisions) Bill, which, at the time of writing, has just had its first reading. Within a period of three months from the passing of the Bill—say, from the beginning of April next—deficiency payments to farmers, which, since 1932, have been collected through the baker, will be made direct from funds provided by the Treasury. The reason is to encourage the production of more home-grown food, and it is hoped that this may be brought about by the removal of artificial barriers such as the restriction under the present Wheat Act, which limits deficiency payments to the anticipated supply of wheat in any cereal year. There will now be no acreage limit or restriction on the total quantity ranking for subsidy. Only the restriction as to quality remains.

Freezing of Vegetables

Experiments carried out by T. N. Morris and J. Barker described in the Report of the Food Investigation Board for the year 1938 demonstrate that the method of direct immersion in brine at

present only appears applicable to materials, such as peas and asparagus, which do not absorb a large amount of salt during freezing. Tests with spinach and cauliflower, in which a large surface is exposed, showed that these vegetables retained too much salt to be palatable, and other refrigerants are being tried for these materials. S. A. Kalotereas, the Director of the Agriculture Research Station at Athens, has obtained promising results using ethyl alcohol at $-60°$ C. and alcohol-water mixture at $-40°$ and $-20°$ C. as direct refrigerants.

The effects of a range of rates of freezing were compared, using several varieties of peas and one variety of asparagus, the samples being examined after four months' storage at $-20°$ C. With both the peas and the asparagus, the samples frozen most rapidly were the best in colour, flavour, texture and absence of wrinkling, and, in general, the quality deteriorated progressively with increasing time of freezing.

Vitamin C in Potatoes

Although it is pointed out that the figures so far obtained for ascorbic acid in the tests cannot be taken as final since the indophenol test for vitamin C is not dependable, especially when applied to canned products, S. S. Silva and T. N. Morris (*loc. cit.*) made some exploratory experiments with canned potatoes alone and in a meat-and-vegetable ration consisting of beef, potatoes, soaked peas, carrots, onions, salt and spice. The canned products were then examined for their indophenol-reducing capacity and the results calculated in terms of ascorbic acid. The meat-and-vegetable ration showed that a loss of only 7 per cent. was incurred in the process of canning, while in the potatoes canned alone this loss was in the vicinity of 25 per cent. As these results are promising, the experiment is being repeated on a large scale under factory conditions.

War or Draught?

A baker was summoned at Norwich recently for offering for sale bread below the proper weight. He blamed the National Service wartime flour.

A fine of 2s. 6d. in each case, 7s. 6d. in all, was imposed, the Chairman saying that the Bench thought when weighing to find the quantities of drams the method was too haphazard, as a disturbance of air or wind might alter measurements. We cannot avoid buying bread made of wartime flour, but perhaps we ought to avoid windy days for our purchases.

Hydrogen Swells

In our January, 1940, issue we published an article describing present views of hydrogen swells. Further light has been thrown on the subject by work done recently at Campden. Representative samples of pack-rolled tinplate obtained from various sources were made into cans of a common type and packed with various fruits. They were stored under tropical conditions, and as each can became a "swell" it was removed and examined. Over 1,100 chemical analyses and nearly 1,000 corrosion tests were made. It was found that the comparative susceptibility of a can to hydrogen swell may be assessed roughly by a corrosion test of the steel base with a pure citric acid solution. The slowest rate of hydrogen swell in lacquered can packs of blackcurrants, gooseberries, loganberries, plums, raspberries and strawberries is given by a steel base with high copper and low phosphorus content. The main conclusion was that the use of tinplate with a relatively high copper and low phosphorus content will, on average, roughly double the usual life of such packs.

Common Cold

While admitting that "any discussion of the common cold must be on insecure foundations since knowledge of its pathogenesis is lacking", a writer in *The Lancet* nevertheless asserts, albeit in a gentle way, that "we are not so ignorant about the disease as the popular press supposes. Colds are certainly air-borne and the vehicle is condensed droplets of infected nasopharyngeal secretion. No specific organism has been isolated, but a filtrable virus seems likely to be responsible". Gout seems to be in the same category if Mr. Bechhofer Roberts' doctor's dictum may be accepted. This was as follows: "The cause of gout is, of course, unknown, but the hypothesis of causality in medicine is as shaky as in other branches of human thought. Analysis always shows that we are merely cutting two slices out of the spatio-temporal continuum and labelling the first "cause" and the second "effect". And all this was about whether noble clarets and "real Burgundies" were worse than Moselle for gout.

We are interested from the dietetic point of view, and it is suggested that where the patient "refuses point blank" to go to bed he can be fed "on concentrated vitamins A, B, C and D and a good full diet", and that the ancient saw "feed a cold" is sound modern therapeutics. However, it seems that we shall have to be satisfied with the two slices of the spatio-temporal continuum for some time to come.

COLD STORAGE TEMPERATURES FOR FOODS

Here is a table which gives at-a-glance data relating not only to the temperatures at which different foods should be stored but also to the nature of their commonly used packings.

Products.	How Packed.	Temp. Fahr.	Products.	How Packed.	Temp. Fahr.
Almonds	In shells	34°—38°	Game	Frozen and carried in freezer	15°—20°
Apples	Barrels	30°—32°	Game	In cooler, short period	25°—30°
Apricots	Basket	40°—45°	Grapes	Large baskets	34°—40°
Beans	Green, bushel basket	36°—40°	Grapefruit	Boxes	35°—40°
Beans	Dried	40°—45°	Hams, etc.	Cured	35°—40°
Beef	Fresh, held in chill	30°—32°	Hominy	Boxes	35°—40°
Beef	Fresh, short-time cooler	36°—38°	Lamb	Fresh, short period	30°—32°
Beef	Cured	40°—45°	Lard	Barrels or cans	36°—40°
Beef	Halves	33°—36°	Lemons, Limes, etc.	Boxes	35°—40°
Beef	Quarters	33°—36°	Lettuce	Bushel crates	35°—37°
Berries	Short periods, 3 or 4 days	36°—40°	Maple sugar and syrup	Boxes	40°—45°
Butter	Box or crate	38°—40°	Meat	In chill	30°—32°
Cabbage	Bulk	32°—36°	Meat	In cooler	36°—38°
Cabbage	Box or crate	32°—33°	Meat	Cured or smoked	40°—45°
Calves	Fresh, held in chill	30°—36°	Milk	Fresh, 40-qt. cans	38°—40°
Calves	Fresh, short time	36°—38°	Milk	Condensed	36°—40°
Cantaloups	Box or crate, 3 weeks	34°—36°	Molasses	Bbls.	40°—45°
Carrots	Bushel crates	34°—40°	Mutton	Fresh, short period	30°—32°
Cherries	Fresh, in boxes, large crate	36°—40°	Nuts	in shells	35°—40°
Cherries	Fresh, in boxes, small crate	36°—40°	Oils, lard, cottonseed, etc.	Bbls.	35°—40°
Cherries	Fresh, in boxes	36°—40°	Oleomargarine	Boxes	25°—30°
Cherries	Dried	40°—45°	Olive oil	Bbls.	35°—40°
Cereal foods	Finished packages	40°—45°	Onions	Sacks, about 2 bu.	32°—36°
Cheese	Cream, etc.	38°—40°	Oranges	Boxes	35°—40°
Cheese	Limburger, etc.	38°—40°	Oysters	In shells, sack	36°—42°
Codfish	Dried	40°—45°	Oysters	In tubs	30°—34°
Condensed milk	Bulk	36°—40°	Peaches and Pears	Half-bu. basket	35°—40°
Corn	Green, bushel crates	36°—40°	Peaches and Pears	Dried	40°—45°
Corn	Dried, sacks	40°—45°	Peas	Green, 1-bu. crates	36°—40°
Cottonseed and other oils	Barrels	35°—40°	Peas	Dried	40°—45°
Cream	Fresh, 40-qt. cans	32°—36°	Pineapples	Plums, etc., boxes	40°—45°
Cream	Condensed	36°—40°	Pork	Fresh, in chill	30°—32°
Currants	In boxes	36°—40°	Pork	Cooler, after chilled	36°—38°
Currants	Dried or cured	40°—45°	Pork	Cured	40°—45°
Dates	Cured, boxes	40°—45°	Poultry	In freezer	15°—20°
Eggs	Crates, 30 dozen	28°—30°	Poultry	Cooler, short period	36°—38°
Figs	Dried	40°—45°	Potatoes	Sacks, 2 bu.	34°—38°
Filberts	In shells	35°—40°	Rice	Sack	40°—45°
Fish	Fresh, short periods	25°—30°	Sausages	Fresh, cooler	36°—40°
Fish	Freezing and glazing	0°— 5°	Sausages	Cured or smoked	40°—45°
Fish	Frozen, regular storing	8°—12°	Skins	Dried	25°—30°
Fish	Dried, in boxes	35°—40°	Skins	Uncured	30°—35°
Fish	Dried, bbls.	35°—40°	Strawberries	Qt. boxes crated	36°—40°
Flour	Any kind from cereals	35°—40°	Vegetables	In bbls.	36°—40°
Fruit	Usual boxes	35°—40°	Vegetables	In bu. crates	36°—40°
Fruit	Half-bushel basket	35°—40°	Watermelons	Short period	34°—36°
			Wines	Bbls.	40°—45°

Compiled by Frick Co., Waynesboro, Penna., U.S.A.

Landing Fish at an English Port. *Courtesy Mather & Platt, Ltd.*

How Brisling and Sild Sardines are tinned is shown in this description of one of the group of factories operated by BRITISH FISH CANNERS, LTD., whose production is now reaching twenty million tins per annum. Some thousand workers, handling five million fish daily, are engaged. Since 1914 this industry has blazed a lone trail, which makes its success the more remarkable.

BRITISH FISH CANNING

T. CROSBIE-WALSH, F.I.C.

THE BRITISH fish canning industry is now a flourishing and well-established one, holding its own against keen and old-standing foreign competition, for, of course, canned fish came into this country from abroad long before a single British fish had found its way into a tin. Like fruit canning, the industry is comparatively young, but its health and strength are manifested by a chain of modern factories around the coast for the canning of native fish such as brisling, sild, larger herrings, lobster, crab, shrimps, prawns and tunny.

British Fish Canners, Ltd., compose an important group of the industry. Their name is appropriate, as British fish is packed into British cans by British labour working with British machinery and British capital.

Early Days

The Company started operations in 1914, when the demand created by the war had nearly doubled the number of factories in Norway. The new concern faced the very severe competition of some 120 Norwegian sardine factories.

The contrast between the methods in vogue in those early days and to-day is very striking. The original procedure was crude. Every fish head was cut off with a pair of scissors, the olive oil was ladled into the tins by hand, and automatic conveying had not been adopted.

By virtue of the increased employment of modern methods—methods which have themselves been evolved in the interim—the production of British Fish Canners, Ltd., alone has increased each year until it is now on the point of reaching the 20,000,000 mark.

Some thousand workers, handling 5,000,000 fish daily, are engaged. The Company owns a number of trawlers and a herring drifter and runs a fleet of motor lorries for transporting the daily supplies of fish to the branch factories.

All the fish is packed in small flat boxes, iced top and bottom, whereby they arrive at the factories in prime condition within a few hours of being caught.

The Inshore Fisherman

This industry has blazed a lone trail, without official support of any kind, which makes its success the more remarkable. For years these nutritious silver fish, on which Norway and many other countries had built up large and important industries, were used in huge quantities as manure on the land, at a price to the fisherman of less than £1 per ton. All this during the last few years, when the inshore fisherman could scarcely earn enough to keep a roof over his head. But still the shops of Great Britain are full of foreign canned fish when the inshore British fisherman is hardly able to make a reasonable living.

It is stressed to-day that the two essential factors of winning the war are a great export drive and the production of more food at home. The packing of British fish into tins must come into both categories. British Fish Canners, under normal circumstances, do a large export trade, mainly with the Empire, but in view of the fact that the production is now inadequate even for home consumption, they have found that it is impossible to entertain any export business whatever.

In the normal course of events two of the Company's

". . . the fish is passed through a washing machine, which consists of a latticed cylinder slightly inclined from the horizontal and rotating in a box of special construction for the removal of scales. The fish are well washed and transferred automatically to the brining tubs.

". . . the rodding operation is carried out by a large staff of male and female operatives. Standing in the middle of appropriate tables are small piles of fish which are manipulated into a series of slots, into which the heads are introduced. The slots being complete, a thin steel rod is used to impale the heads.

". . . the frames of fish are placed in ovens fired with oak logs. The smoking process approximates to an art, and a considerable amount of judgment is exercised by those in charge of this operation. The smoking time is 30 to 40 minutes, depending on the size of the fish." The illustration shows the ovens with doors open.

large canning factories, each capable of preserving 10 to 15 tons of fish daily, will close down this month until next October, as the seasonal brisling and sild sardine production is now coming to an end. This prompts the question as to whether large supplies of other canned fish are not required, with the consequence that the shutters are put up for seven valuable months on such a means of potential food production in the shape of factories replete with modern plant.

We are obliged to refrain nowadays from mentioning specific localities, and it must therefore be sufficient to say that the following description is of a factory, typical of a group of several, situated practically on the waterside and admirably located for receiving supplies of raw material.

At the time of my visit the season for the canning of brisling and sild sardines was at its height, and a constant stream of fresh little silver fish amounting to 10 tons per day was pouring into the factory gates, all of which was to find its way into tins on the day of arrival.

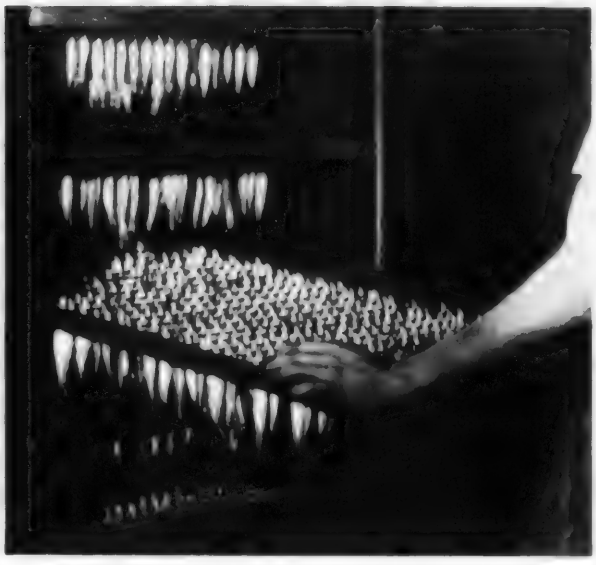
Certain parts of the English and Scotch coasts are noted for the quality of brisling which are caught in the inshore fisheries from October to March. For the most part this fish is unloaded from the boats in wooden boxes direct into the factory.

Washing and Brining

It is said that there are no less than seventy vital points to be mastered before anyone can call himself an expert fish canner, the main operations involving a number of minor, albeit important, details, the neglect or overlooking of which renders impossible the realisation of most canners' ideal—the best.

The first stage in the journey of the live fish into their neatly wrapped resting-place—the tin—is that of washing and removal of scales. The two operations are carried out in one machine, which consists of a latticed cylinder slightly inclined from the horizontal and rotating in a box of special construction for the removal of scales.

A " close up " of the rodding operation. On top left are the rods of fish waiting to be put into the frame. Completed frames are shown on bottom left.



A " close up " showing the introduction of a frame of fish into an oven.

Owing to the market value of the scales as the raw material for imitation pearls, a special appliance is used to collect them as they emerge from the machine.

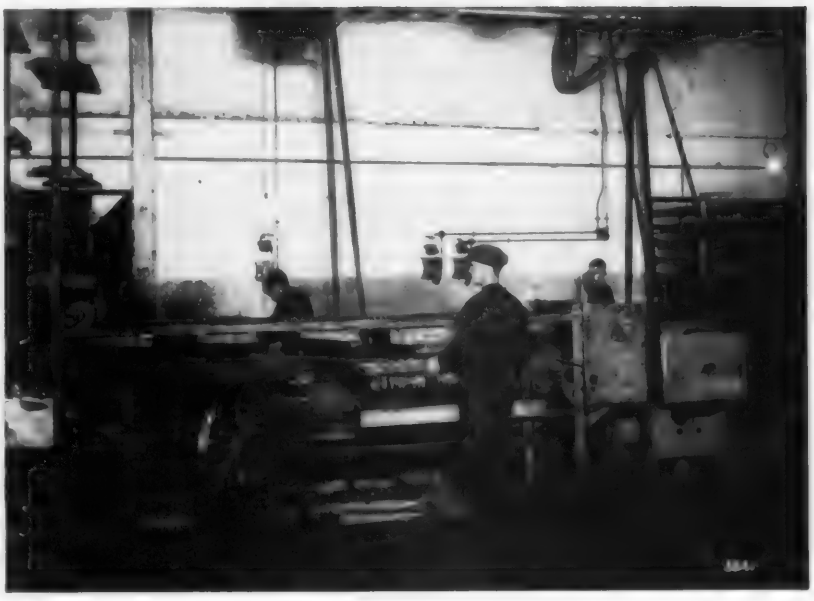
The perfectly washed and scaled fish are next conveyed automatically to the brining tanks. The brining process is an important detail in the pre-treatment of the fish, and considerable study has been devoted to the length of time in which they are allowed to remain in a brine of such strength as will give best results in developing the final flavour of the product.

Rodding

From the brining vats the fish are drained in baskets to eliminate any excess of salt solution adhering to them. They are then conveyed to the rodding tables. This operation is carried out by a large staff of skilled male and female operatives in a spacious, well-lighted department. Standing in the middle of appropriate tables are small piles of fish, and at each table work two workers opposite each other, manipulating the fish into a series of slots, into which the heads are introduced. The slots becoming complete, a thin steel rod is used to impale the heads. The rod, with its hanging row of fish, is fitted in a frame, which is placed conveniently near the rodding table. Each frame has a capacity of nearly 600 fish. The frames are loaded on to movable racks, which are disposed near the ovens for smoking.

Smoking

This process may be considered as a triple one: first, the removal of part of the natural moisture contained in the flesh of the fish; second, preliminary cooking; and, last, the absorption from the smoke of aromatic substances which impart the characteristic flavour of the final product.



". . . frames loaded with smoked fish are placed upon a conveyor which comes into contact with a revolving band knife on the head-cutting machine, which accurately decapitates the fish at great speed. The decapitated fish fall on trays disposed on a travelling belt, which conveys them to the packing tables." In the early days of the industry head-cutting was done with scissors.

The ovens are fired with oak logs. Large stocks of oak are held in the factory, and the logs are cut to size as required.

The frames containing the fish are placed in the ovens one above the other on a series of bars, which act as supports. The smoking process approximates to an art, and a considerable amount of judgment is exercised by those in charge of this operation, although they so adjust oven conditions that the time taken for completion does not vary materially in ensuring the correct point of drying and smoking. The smoking time is 30 to 40 minutes, depending on the size of the fish. The capacity of each oven is ten frames, and thus nearly 6,000 fish are smoked per oven-load. In the factory described there are fifteen ovens, and that means nearly 100,000 fish every 30 to 40 minutes.

Head Cutting

Having been unloaded from the ovens, the frames are placed in trolleys for conveyance to the head-cutting machine. These frames, now loaded with smoked fish, are placed upon a conveyor, which comes into contact with a revolving band knife on the head-cutting machine, which accurately decapitates the fish at great speed. This machine is adjustable to take different sized fish, and to place large or small quantities of fish on each tray as required. The decapitated fish fall on trays disposed on a travelling belt, which conveys them to the packing tables. The heads, which have remained on the rods during the decapitating operation, are, in due course, removed and bagged. For the most part the heads are used without further treatment as a slow-acting fertiliser in agriculture.

". . . a conveyor runs between two long rows of tables occupied by the packers. On one side the operatives take their trays of fish and empty them on to the space in front of them; on the other are trays of packed fish. As each tray of packed tins is completed it has to run the gauntlet of one of the staff of supervisors, and it is no exaggeration to say that not one single tin of those made from the handling of 10 tons of fish (per factory) escapes inspection."

". . . This packing of the fish into tins is just one of those jobs which cannot be done automatically, and very deft are the fingers which arrange those neatly fitted symmetrical layers of silver fish—head to tail." A close-up of the packing operation. A small size tin contains ten fish, a medium size from sixteen to eighteen, while still larger tins hold up to forty.

Packing the Fish

The loaded trays of fish now pass along the conveyor, which runs between two long rows of tables occupied by the packers. On one side the operatives take their trays of fish, which they empty on to the space in front of them; and on the other are trays of filled tins. The empty trays from the head-cutting machine are placed on a return belt, to be used again after washing. This packing of the fish into tins is just one of those jobs which cannot be done automatically, and very deft are the fingers which arrange those neatly fitted symmetrical layers of silver fish—head to tail. A small size tin contains ten fish, a medium size contains from sixteen to eighteen, while still larger tins hold up to forty.

As each tray of packed tins is completed it has to run the gauntlet of one of the staff of supervisors, and it is no exaggeration to say that not one single tin of those made from the daily handling of 10 tons of fish escapes inspection.

There are two main packings—fish with tomato sauce and fish in olive oil. Incidentally, it is of interest to note that the preference for one or other of these two forms is regional, as it is with such articles of food as butter and bacon. In South Wales, for instance, the olive-oil pack is overwhelmingly popular, as it also is in the South-East of England, whereas in the North and Midlands the tomato sauce variety is frequently preferred.

The addition of these two ingredients is carried out in different ways. Owing to the viscosity of the tomato sauce, and in order that it be evenly distributed, it is added in two stages—half before the fish are packed and half afterwards. The olive oil is all added to the packed tin. In each case the materials are introduced by means of specially designed filling machines, which are adjustable to deliver varying amounts, according to the size of tin being handled. Each filling unit for olive oil has a capacity of 3,000 tins per hour, and does its work without a single splash of oil.

Closing and Sterilising

A large battery of double-seaming machines, each of which has a capacity of 2,500 to 3,000 tins per hour, is ranged at right angles to the retorts, facilitating the loading of the closed cans into them by means of a conveyor, which separates the tins according to size.

No exhausting or vacuumising process intervenes between the closing and the retorting operations.

Washing the Full Cans

The washing of the cans is done in a type of washing machine which I do not remember having seen before. It consists of a tank divided into two parts, each part having suspended above it a large basket. The tins are loaded into the first basket, which is then lowered, whereby it is immersed in a detergent solution. The two baskets are counterbalanced, so that when one is raised the other is automatically lowered. The second half of the tank is used for washing the tins in boiling water to remove any detergent remaining on them. Discharged from this basket, the tins are carried by a travelling belt through a steam-heated hot-air drying elevator, and from thence to the table, where a final polishing is given.

The journey is nearly complete. Conveyed to the packing room, the tins, each one supplied with its opening "key", are strip labelled, wrapped in impermeable paper, upon which the label is pasted. In all, some fourteen different sizes and shapes of cans, including the larger herring pack, are handled.

Can Making

The cans used in the factory are made in a special department. The sheets of tin, lacquered or otherwise, are first passed through the tinplate oiling machine, where it acquires a thin film of oil. Deep stamping presses of high productive capacity turn out a constant

". . . The addition of olive oil and tomato sauce is carried out by means of specially designed filling machines, which are adjustable to deliver varying amounts, according to the size of tin being handled. Each filling unit for olive oil has a capacity of 3,000 tins per hour, and does its work without a single splash."

". . . A large battery of double-seaming machines, each of which has a capacity of 2,500 to 3,000 tins per hour is ranged at right angles to the retorts, facilitating the loading of the closed cans into them by means of a conveyor."

stream of cans and lids, which are delivered at the end of the presses, while the scrap metal trimmings fall into the scrap-separating riddlers. The cans are placed on a conveyor system, which delivers them to the packing room as required.

Lids as passed through machines, which by means of heat pressure affix a rubber ring, form the basis of the double-seaming process.

One of the few by-products of manufacture, in addition to the heads and scales of the fish, is the scrap metal, which is baled by an appropriate machine and thus disposed of, mainly for de-tinning.

The foregoing presents the practical phase of the brisling and sild sardine side of the British fish canning industry. Of patient experimentation on improved methods of fishing, of the position of inshore fishermen, of the possibility of further increasing the industry by means of increased duties on foreign produce, much could be written. Suffice to say here that as a result of the energy and initiative of those concerned in British Fish Canners, Ltd., and especially of Mr. C. W. Banks, their Chairman and Managing Director, a Past-President of the National Food Canning Council, an organisation has been built up which compares well with any other branch of our canning industry, which has gained a world-wide name for the high quality of its products.

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Deep Stamping Presses: *E. W. Bliss Co.; J. Rhodes and Sons, Ltd.*
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Rubber Rings: *Poppe Rubber and Tyre Co.*

A Farm Ice Creamery, Ltd., Product.

Two main problems will face the ice-cream manufacturer in the coming season. One is concerned with supplies of fat and the other with those of sugar. L. J. HYNES, author of *Handbook for Ice-Cream Makers*, discusses the different substitutes for these materials.

ICE-CREAM MANUFACTURE IN WAR-TIME

THE WAR has placed ice-cream manufacturers, among many others, in a difficult position. There are two main problems, the one concerned with the fat content of ice-cream, the other with the sugar. We shall deal with them separately in an attempt to find the best practical solutions.

Fat

The normal fat in ice-cream is, of course, butterfat, or milkfat as many are now inclined to call it. The best medium for conveying the necessary fat, of which good commercial ice-cream requires from 8 per cent. upwards, is cream. For the duration of the war, however, cream will not be available in anything like ample quantities, and such as may be available will be at a price far too high to be of interest to ice-cream manufacturers, with the possible exception of a few who market an "exclusive" sort of product for which they can command an exclusive sort of price.

The obvious alternative to cream is high-grade unsalted butter. The supply of this for manufacturing purposes will be *nil*, or practically *nil*. Lower grades of butter will be available in limited quantities, but these, used as butter, are of no use whatever to ice-cream manufacturers. However, such inferior butters—products not of "table quality"—can be processed for extraction of the butterfat, and in the process the off-flavours, including ordinary rancid flavours, are removed. Incidentally, this is a fact of which very many in the ice-cream trade are totally unaware. At first glance it might appear that in this fact the ice-cream manufacturer could find a prompt solution of his butterfat problem. Unfortunately, there is a serious difficulty.

Although, as has been said, the pure (100 per cent.) butterfat extracted from butter is freed in the process from rancid and other off-flavours it may have possessed, it nevertheless retains the characteristics of the butter from which it was produced—the characteristic flavour, for example. A mild butter will yield a mild-flavoured butterfat, and a "strong" butter a butterfat of similar flavour. Now, the latter is not suitable for use in ice-cream, since it "shows through" very prominently, and cannot effectively be covered up. But, as things are at present, an ice-cream manufacturer (or any other manufacturer, for that matter) cannot pick and choose the sort of "manufacturing butter" he wants. He has to take what he can get, to a maximum allocation of 50 per cent. of the amount of butter, irrespective of the quality, he used last year. Hence, he may receive a consignment of "strong"-flavoured butter quite unsuitable, as far as he is concerned, for processing by itself. All he could do, if he were in a position to do it, would be to hold it until he had accumulated enough of the milder butters to admit of the stronger-flavoured stuff being worked in with them, in small amounts calculated to produce the minimum of undesirable flavour effect. There are very few manufacturers who could afford to do this.

Speaking generally, then, butter must be ruled out as a material for use in war-time ice-cream. The ice-cream manufacturer has no alternative but to find a substitute.

Substitute Fats

As substitutes for butterfat certain refined vegetable oils, both hardened and non-hardened, are very suitable for use in ice-cream—ground-nut oil, for example. Coconut oil, refined and deodorised, is another useful

product for this purpose, and the writer has had very good results with it. The same is true of the best proprietary fats, whether wholly vegetable, as some are, or mixed with a proportion of animal fat. It must not, however, be assumed that all fats offered to the ice-cream manufacturer as substitutes for butterfat are suitable for his purpose. Some of them yield a decidedly unpleasant and quite apparent off-flavour, while others, primarily intended for other purposes, may not be satisfactory as regards melting point. However, if the ice-cream manufacturer will purchase from a reputable firm a butterfat substitute expressly intended for use in ice-cream, and especially if such a product is generally recognised in the trade as being in every way suitable, he will not go wrong.

These "vegetable butters", as they are often called, are virtually 100 per cent. fat, and are, therefore, in this respect similar to the pure butterfat to which reference has already been made. They may be used alone—to supply all the fat in the ice-cream, that is—or in combination with pure butterfat (if available) or a suitable vegetable oil. When using these "100 per cent. fats" it must, of course, be remembered that they will not be required in the same proportions as butter, which contains 84 per cent. of fat or somewhat less, or margarine. For example, in every 100-lb. batch of mix containing 8 per cent. of fat derived solely from dairy butter, 9½ lb. of butter would be required, but if the fat were provided by pure butterfat or one of the "vegetable butters" we have been discussing, only 8 lb. of such product would be used.

Margarine

The best unsalted margarines are also very satisfactory as substitutes for butterfat in ice-cream, but, as compared with the 100 per cent. fats of similar quality, they offer the ice-cream manufacturer no advantages, certainly none of any considerable importance. True, some margarines are better than some fats of the other type, but, given similar essential quality, neither has any outstanding claim to superiority over the other as far as ice-cream manufacture is concerned. Both are produced from combinations of the same oils, but margarine, since it is primarily designed to take the place of butter for ordinary household purposes, is processed to give it the necessary characteristics. Obviously, these latter are of no interest to the ice-cream manufacturer. Margarine may be somewhat higher in one or two vitamins than "vegetable butters" generally, but, from an ice-cream standpoint, that is of relatively small importance.

Sugar

Let us now consider the question of the sugar content of ice-cream mixes as affected by the limitation of supplies.

In the first place, a certain amount of sugar, either cane or beet, is absolutely necessary in a normal ice-cream. No substitute can satisfactorily be used alone. Dextrose (dry glucose), for instance, cannot be used to replace sucrose (cane or beet sugar) entirely, because its effect in depressing the freezing point, which is nearly twice that of sucrose, would raise freezing and storage difficulties of a serious nature, in some cases especially. The use of glucose syrup to provide all the desired sweetness is also impracticable, chiefly because of the enormous quantity which would be needed (this product having less than half the sweetness of sugar), and of the pronounced "syrupy" taste, the excessive viscosity and the freezing and storage difficulties which this quantity would cause. Saccharin as the sole sweetening agent of ice-cream is out of the question, partly because its use would deprive the ice-cream of some 12 to 14 per cent. of solids, with consequently disastrous results to body and texture, even though the normal overrun were drastically reduced, and partly because of the characteristically unpleasant taste—more of an after-taste—which relatively large proportions of saccharin produce.

The ice-cream manufacturer, then, must include in his mix as much sugar as he can possibly spare. It will then remain for him to supplement this with one or more of the other sweetening agents available.

Sweetening Agents

Unfortunately, the supply both of dextrose (the dry product) and glucose syrup is likely to be short, while prices will probably remain comparatively high. However, a small quantity at disposal is better than none, and if some of each of these products is available a proportion of both may be used in combination. In the event of the mix still lacking sweetness to a moderate extent, a little saccharin may be used to complete it.

Hydrous dextrose, offered to the trade under a trade name in this country, has for some time found favour with many manufacturers. Its sweetening power may be put at about 70 per cent. of that of cane or beet sugar, so that to replace 1 lb. of the latter about 1·4 lb. of dextrose would be required.

Glucose syrup, which contains somewhat varying proportions of dextrose, maltose and dextrin, with about 18 per cent. of moisture, has far less sweetening power than cane or beet sugar; roughly, from 2 to 2½ lb. are required to replace 1 lb. of the latter.

Assuming that the ice-cream manufacturer finds it necessary to reduce his normal sugar content by some 50 per cent., as is extremely likely, the following combination of sweetening agents might be suggested:

6·5 per cent. of sugar.
5·4 ,, ,, ,, dextrose.
5·0 ,, ,, ,, liquid glucose.

This combination would give an equivalent of 12 to 13 per cent. of sugar in sweetening power, and would be quite practicable. There would be no "glucose taste" whatever, neither would the freezing point be inconveniently depressed.

If there were some small shortage of dextrose or glucose syrup, a little saccharin might be used. The sweetening power of this substance as ordinarily marketed should be about 550 times that of sugar. If, then, there were a shortage of, say, 45 lb. of dextrose in a large batch of mix, this quantity being about equal in sweetening power to 31·50 lb. of sugar (*i.e.*, 45×0·70),

then the amount of saccharin required would be approximately 1 oz.

For some years past the form of dry dextrose which has been marketed in this country, and has enjoyed considerable popularity with ice-cream manufacturers, since it not only afforded a means of building up the total sugar solids without increasing the sweetness, but at the same time appeared to prove of some value in delaying the possible development of "sandiness", or lactose crystallisation, owing to the shortage of the basic raw material (maize) used in the normal manufacture of this product is not now available, certainly not in any considerable quantities. However, it is understood that experiments have been made for some months with a view to marketing a more or less similar product, and it may be that by the time this article is published such a product will have appeared.

Invert Sugar

The use of invert sugar as a substitute for ordinary sugar is not, in the circumstances, practicable. With only half the normal sugar quantity available—about 6·5 per cent. or so of the weight of the mix—we could not afford to invert more than about 1 per cent., since we must have a minimum of at least 5·5 per cent., and preferably more, of sucrose in our mix. Inversion of this small proportion would not be worth while.

Honey

Honey is expensive; moreover, since the sugars in it are chiefly glucose and fructose, with a little sucrose, its use must be limited for the reasons which apply in the case of dextrose. However, it may be used, if necessary, in combination with sugar; for example, 6·5 per cent. of sugar and 7 to 9 per cent. of honey might be tried, although with the higher proportion the ice-cream would possess a noticeable honey flavour. A better plan would be to use honey to replace some of the dextrose or glucose syrup, in the event of a shortage of either. Its sweetening power is about the same as that of dextrose—roughly 70 to 75 per cent. of that of sugar.

In general, it may safely be laid down that no substitute or combination of substitutes can satisfactorily replace all the sugar in an ice-cream mix. A minimum of 6 per cent., or at the very least 5·5 per cent., may be considered indispensable. This may be supplemented by varying proportions of dextrose and glucose syrup. It is preferable to use 6·5 per cent. (or more, if available, of course) of sugar when, in combination with dextrose or glucose syrup or both, the desired sweetness is to be the equivalent of 13 per cent. of sugar. With 6·5 per cent. or more of sugar available, 1 per cent. or so may be inverted, and the proportion of dextrose or glucose syrup correspondingly reduced. Honey may proportionately replace either of these sweeteners when combined with about 6 or 6·5 per cent. of sugar, but if a larger proportion replaces both the ice-cream will tend to have a more or less distinct honey flavour. Saccharin should be used as little as possible—only when, through the shortage of other sweeteners, the ice-cream falls slightly below the desired degree of sweetness.

Mould Control in Bakery Products

THE old problem of mould, so much enhanced during the past twenty years by the introduction of sliced wrapped bread along with a popular demand for moist loaf, has been solved, after many unsuccessful attempts along other lines, by the discovery of the fact that propionic acid in the form of its salts is an inhibitor of the growth of mould.

This acid is used in the form of its salts, particularly calcium propionate, in concentrations between 0·1 per cent. and 0·3 per cent. It will delay mould in normal white bread under the worst summer conditions from two days to two weeks, depending upon original contamination of the bread and the concentration used.

Propionic acid and the propionates are naturally occurring materials. They are developed by the *Bacterium acidi propionici* from the fermentation of lactic acid, and occur, in traces at least, in almost any food which undergoes lactic fermentation.

The development of the propionates as mould inhibitors in foodstuffs resulted from the idea which developed in the bakery, that vinegar has mould-inhibiting qualities. Since the active material in vinegar is acetic acid, and since propionic acid is closely related to it, this whole series of acids was investigated. It was learned that their mould-inhibiting qualities increase as the series is ascended and as the acidity of the medium increases. The acids above propionic in this series are too odoriferous for commercial work.

In the course of work on mould in baking products it was learned also that propionates have a very strong inhibiting effect upon certain bacterial organisms, particularly rope. Oddly enough, it is commercially effective at the same concentrations which inhibit mould. Its effect also becomes decidedly greater as the acidity of the medium increases.

The propionates, by virtue of their natural occurrence, are entirely wholesome. Their very extended use industrially has demonstrated that they do not adversely affect the flavour or texture of the bread. Lastly, the cost of calcium propionate is such that it definitely pays its own way.

Calcium propionate is added at the dough stage of the sponge-and-dough process in the concentrations already indicated, with variations depending upon the results desired. Because of the wide variation in practice on straight doughs, the recommendations for the use of propionates are adjusted to the specific case.

Unfortunately, most cakes and sweet goods are too alkaline to permit the application of sufficiently large quantities of propionates because of taste considerations. Pies, particularly the fresh fruit types, have been satisfactorily handled on an industrial scale by the application of propionic acid, since the sodium and calcium salts discolour the fruit because of their alkalinity.

In conclusion, we may say that the advent of a non-toxic, naturally occurring material which in low concentrations inhibits the growth of mould and rope sufficiently to be of industrial importance marks a new step forward in the technology of food.

Calcium propionate (mixed with small amounts of ammonium bicarbonate) has been merchandised since 1936 as a mould and rope inhibitor for bread. Other propionates for purposes outside of the baking industry are also available.

Presented by Mr. Frederick W. Miller, Jr., at the Second Food Technology Conference at the Massachusetts Institute of Technology.

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To "Food Manufacture"

Copies of the comprehensive 6-page index to last year's issues are still available to subscribers, who should apply to:

The Publishers, *Food Manufacture*
17, Stratford Place, London, W.1

COLD STORES
PUBLIC OR PRIVATE ?

It would be wise for the food manufacturer to safeguard himself by having his own cold stores erected on or near his premises. In doing this he would render valuable service by freeing cold storage space for the Nation's food reserve while at the same time he would be gaining many advantages. In the course of this eminently practical article JOHN J. PIQUE, the well-known consultant on Food Storage, Refrigeration and Air Conditioning, gives such information to the food manufacturer as will enable him to take the necessary steps in providing himself with suitable equipment.

IN A STATEMENT recently made, the Secretary of the Ministry of Food said that the principal difficulty with which the Ministry and food traders will have to contend in the future will be a shortage of cold storage space, and that deficiencies already exist in the inland areas and to a lesser degree in the West Coast ports.

How will this affect the food manufacturer whose supplies of raw materials arrive via public cold stores or whose finished products are cold stored?

Inland Cold Stores

The reserve of essential foodstuffs which the Ministry is building up is being distributed over a large number of cold stores inland in order to minimise transport when the need arises to draw upon the reserve. Foodstuffs stored for the Ministry are already stowed in bulk in order to save space, and before long it may be found necessary for all commodities to be stored in bulk without regard to country of origin, ship or mark.

The food manufacturer cannot under the circumstances expect the public cold stores to provide or reserve space where his relatively small quantity of produce is kept separately and easy of access. Space left available for the regular cold-store client has to be used to the full, every cubic foot of it; the commodities stacked to the ceiling, and stacks of goods belonging to different clients bunched together.

The Ministry's Programme

The accommodation available for the food requirements of the nation under war conditions is not sufficient, and the Ministry of Food has therefore decided to have eight temporary cold stores erected as a first instalment of their programme of construction.

The completion of these stores will take some time. It may well be that before this the Ministry may have to claim priority of public stores space.

No one can prophesy whether this will happen or how

A cold chamber having a storage capacity of 13,500 cu. ft. This store is efficiently insulated with slab cork 9 in. thick on the walls and 6 in. thick on the floor. The ceilings are insulated with 10 in. of granulated cork. The room is cooled by direct expansion grids on the walls and ceilings, arranged in circuits so that the other rooms can operate at different temperatures if necessary.

Courtesy J. & E. Hall, Limited.

soon this may happen; the trend of affairs indicates, however, that it would be wise for the food manufacturer to safeguard himself by having his own cold stores erected on or near his premises. In doing this he would render valuable service by freeing cold-storage space for the nation's food reserve, while at the same time he would be gaining certain advantages.

Quite a variety of raw materials are cold stored for the food manufacturer, such as:

Meat, for making sausages, potted meats, meat pastes, canned meat, meat pies, etc.
Poultry, for canning, chicken broth, etc.
Eggs in shell, liquid eggs and white of egg, for cakes, pies, lemon curd, proprietary drinks, medicinal purposes, breweries, etc.
Lard, margarine, butter, cream, currants, etc., for meat pies, cakes, biscuits, pastries, sweets, chocolates, etc.
Fruit and fruit pulp, for jams, sauces, ketchup, canning, bottling, etc.

Cold-storage space is also occupied by finished products such as smoked haddock, kippers, cheese, margarine, cream, yeast, etc.

Advantages of Private Stores

Cold stores adjoining food factories, bakeries, preserving works, etc., would prove to have a number of advantages—for instance:

The commodities can be taken into or out of storage as and when required. Loading and unloading at public cold stores will, in all probability, be delayed as the war proceeds, through labour shortage or through priority of handling the nation's food supplies.

Transport costs would be greatly reduced.

Unused material can be put into storage overnight or over week-ends without extra cost.

It can be said that, calculated over a number of years, private storage in general proves to be less costly than the total amount to be paid to public stores.

A point very important to many users of foodstuffs is that private stores could be equipped with facilities not available in public cold stores—*i.e.*, facilities which minimise certain types of deterioration of foodstuffs, minimise wastage or which are necessary for the proper storage of the product; for instance:

The development of rancidity in fats, with, in many cases, development of a tallowy odour and flavour, can be checked if the storage atmosphere contains a small percentage of carbon dioxide. Stores in which gases are added to the atmosphere have to be gas-tight; this construction is not expensive, and is extensively used in the gas storage of fruit.

The growth of moulds on fruits is prevented or retarded by small concentrations of the vapour of acetaldehyde, while small concentrations of ammonia prevent or retard the growth of "green" and "blue" moulds of citrus fruits.

The ripening of cheese, mould development and evaporation can be controlled in gas storage combined with humidity control.

Control of air humidity in the store at the appropriate percentage, which will check the development of moulds and bacteria, prevents the discoloration of meat due to drying, and limits the desiccation of foodstuffs in general.

Adjustment of Conditions

Cold storage in which all deterioration would be eliminated or minimised to the utmost can only be achieved by the combined effect of temperature, relative humidity, air movement, composition of the storage atmosphere. These factors vary for different foodstuffs. Public cold stores are not equipped to enable the proper adjustment of these factors for each kind of foodstuff, and in many cases it does not pay them to segregate commodities—*i.e.*, to have separate stores, say, for butter only, for rabbits only, for poultry only, and so on.

Taint is often caused through foodstuffs absorbing odours from other commodities stored in the same room; it may also be caused by odours from articles previously stored which were absorbed by the insulation. Some stores have a definite musty smell; in others are found large areas of walls and air ducts covered with moulds. The type of construction of stores is, in many cases, the root of the trouble.

Financial considerations have mostly been the reason why defective stores built years ago have not been reconditioned; in other cases it has been due to the lack of technical knowledge. The resultant fact remains that it is the cold-storage client who suffers losses.

Equipment is Simple

The equipment required for the control of humidity, for gases making up the composition of the storage atmosphere, etc., should not be branded as scientific gadgets, an appellation which scares the average manufacturer. Such equipment is quite simple.

It is incorrect to assume that gas stores cannot be opened for the removal of small amounts of goods without losing all the "gas". The loss of gas is small, and the atmosphere can easily be made up to its proper concentration.

Food manufacturers should not be deterred from having their own cold stores erected by the assumption that skilled staff would have to be engaged at high wages. The running of the refrigerating plant, pumps and fans is a task which the ordinary maintenance engineer can easily manage, and in most cases attendance for a short time daily would be all that is required. The cubic capacity of most stores would only be a fraction of that of a public cold store; perhaps only two different temperatures would have to be maintained, and consequently plant for private stores is much simpler than the rather complicated plant of large public stores. The plant for private stores would, in many cases, come within the range of machinery which is now supplied as fully or partly automatic plant, requiring no attendance except occasional oiling and greasing.

With regard to the conditions to be maintained for the proper storage of each commodity—that is, temperature, air movement, air humidity, control of mould and bacterial development, etc.—it would be most encouraging if the Ministry of Food offered a free service of technical information on these matters in return for the manufacturer rendering service in freeing cold-storage space for the nation's food reserve.

Types of Plant

Manufacturers intending to have their own cold stores erected would probably obtain quotations from two or three makers of plant; in many cases they would be puzzled by the difference in cost for supposedly similar plant. The quotations would comprise different types of cooling, air circulation and machinery.

A refrigerating installation is a combination of several mechanical units which can be interconnected to form numerous variations. There is a wide range of types and construction of the various parts required in the making of a complete refrigerating plant. There are, for example, various types of plant operating on such principles as compression, absorption, resorption, adsorption and vacuum; several types of condensers, evaporators, air coolers and air circulation; sundry accessory plant, automatic valves and fittings; a number of refrigerants such as ammonia, carbon dioxide, ethyl chloride, freon, etc.*

Selection of Plant

A combination of certain units and the general layout which has proved to be suitable for a particular purpose or in a particular storage plant may be quite unsuitable for another case. It is clear, therefore, that it would be wise to seek expert advice in order to ensure the right combination of plant which will prove to be the most efficient and economic for a particular purpose.

Manufacturers contemplating the erection of cold stores should beware of agents (representing makers) who make excessive claims as to efficiency and workmanship of plant they offer. Many users of small plant have had unhappy experiences in this connection. Insufficient thickness of insulation of stores, poor finish of insulation, inferior types of fittings and mediocre workmanship, resulting in high running costs and repairs, are generally the explanation of low quotations.

It would indeed be helpful if the above suggested technical bureau were to include in its service free advice on plant and equipment offered to manufacturers.

Cost of Installation

The cost of erection of cold-storage plant will, of course, be an important factor. Existing buildings can generally be converted. We will consider plant of a cubic capacity of actual cold-storage space ranging from 12,000 cubic feet to 100,000 cubic feet. Where new buildings are required it will, for the size of plant under consideration, generally be cheaper to have single-storey buildings.

Brick buildings with concrete floor and asbestos roofing work out at £2 per 100 cubic feet capacity. Loft space under the roof which cannot be used for cold storage has to be calculated at the same rate.

The cost of insulation represents a large proportion of the total cost of the complete storage plant. Stores to be maintained at low temperatures for commodities such as frozen fish, frozen meat, etc., require thicker insulation than stores to be kept at temperatures above freezing point. The cost of refrigerating plant is also affected by the temperature to be maintained. Further, small storage plants—say, per 100 cubic feet capacity—are more costly than larger plant. For example:

The cost of storage plant for frozen meat, of 12,000 cubic feet capacity, works out at about £8 16s. per 100 cubic feet, while for 60,000 cubic feet capacity the cost is about £6 14s. per 100 cubic feet.

The cost of storage plant for chilled meat, of 20,000 cubic feet capacity, works out at about £7 8s. per 100 cubic feet, while for 100,000 cubic feet capacity the cost is about £4 4s. per 100 cubic feet.

These costs include all machinery, plant and insulated cold stores. A certain expenditure will have to be incurred for electric power and light installation, water piping to condenser and drain therefrom.

It must be understood that the above-mentioned costs would be higher if the storage capacity were subdivided into a number of small rooms.

Reconditioning Existing Stores

In the statement referred to at the beginning of this article the Secretary to the Ministry of Food also said that the Ministry is prepared to consider proposals from cold-stores proprietors for reconditioning obsolete stores and improving existing stores, but that such proposals can normally be entertained only in respect of stores in the western half of the country.

This statement should be borne in mind by food manufacturers who might be offered the purchase or use of existing cold stores not yet used by the Ministry. Most of these stores have not been used or only partly used for years. The writer warned the Government Department dealing with food reserves of the inefficiency and uselessness of some stores as long ago as June, 1937, in an article published in this journal.* The cost of reconditioning may well prove to be higher than the cost of new stores. In reconditioning one has not only to consider the state of insulation and its finish, but also the state of repair of all mechanical plant and appliances and the running costs of old plant.

True economy suggests that it would be wiser for the Ministry to assist financially manufacturers who wish to erect cold stores adjacent to their premises than to subsidise repairs of old stores.

It can be said that in general a food manufacturer would reap benefits from storing his raw materials and finished products in his own cold store. The Ministry of Food should recognise the national service manufacturers would thus render by assisting them on all technical matters relating to storage and refrigeration.

* See "*Refrigerating Installations*", J. J. Piqué, *Dairy Industries*, March to August, 1938.

* See "*The Storage of Food for the Emergency of War*", J. J. Piqué, FOOD MANUFACTURE, June, 1937.

EXPERIMENTS FOR FOOD MANUFACTURERS

IT WOULD be a safe wager to make that the curious visitor to almost any food factory in the country would find evidences of some experiments being undertaken for some reason or another. Not only do minor problems have a way of obtruding themselves into the best regulated concerns—problems which must be tackled urgently—but the magic words "new lines" flit around the minds of those august persons whose names are "directors"—words whose echoes reach managers, chemists and other executives, falling upon their ears to produce repercussions dependent upon the measure of their investigatory *flair*.

Thus it is that a book with a title such as possessed by that under review* cannot fail to interest those food manufacturers, at any rate, whose processes involve any kind of cooking process. It really doesn't matter for whom the book was originally written, which the author states are those students who will meet food problems in their professions but are not primarily interested in food research for its own sake. However, she immediately goes on to say that there is only a hairline distinction between experimental cookery and food research, showing its value, scope and technique. So at first sight the book affords a stepping-stone to research, and whether all this has an appeal to manufacturers *in esse* or *in posse* is the thing which this review will attempt to discuss. That there is still ample room for such aids for students is demonstrated by the number of letters which are received from the younger generation desirous of entering the food industry and wanting to know how exactly to do it and what books to read. This book, for one, can be recommended, even if it presupposes an amount of scientific knowledge which is derived from a fair preliminary education and, with due deference to the teaching of science in the schools, a modicum of subsequent burning of the midnight oil and attendance at evening classes at one of the different institutes, now happily continuing. However, as has been suggested, the neophyte is not the only potential reader.

* * *

The book plunges at once into the subject of acidity, because "there is hardly a food in which the acidity or basicity does not play an important part. The size of sugar crystals in fudge, the jellying power of fruits, the texture of batters and doughs and the colour of fruits and vegetables depend upon the amount of acid and base which they contain". It is rather dreadful to read that "instruments for measuring *p*H values electrometrically have been so perfected and mechanised in the last few years that *p*H values of solutions can be determined accurately and rapidly with *little knowledge of the principles of the method*". Italics mine, because this is not a good suggestion to the student. "Pa" John Castell Evans did one big outstanding thing among others: he drove into the heads of his students the golden rule—"take nothing for granted".

* * *

"The field of experimentation in food flavours is one of the richest and perhaps one of the most difficult." To put it vulgarly, the author "is telling us", and brightly proceeds to demonstrate this by means of a mixture of scientific data and anecdote. One feels a little bit dazed after reading the chapter.

"The work of Trout and Sharp at Cornell has recently demonstrated that conditions can be found where judges are able to discriminate accurately and consistently between small differences in tastes." That looks like a truism, but these judges seemed quite good at it, and "perhaps of greatest importance was the observation that accuracy in judgment is greatly affected by the ability of the taster to concentrate. Slight distractions such as conversation in the room . . . affected the accuracy of the results. Undoubtedly the confusing results often obtained during a sensory examination are due to faulty conditions and lack of concentration". Under certain conditions, it would seem that coruscant persiflage at the dinner table may usefully serve to cover a multitude of culinary sins!

Let it not be concluded that this chapter lacks interest and value, although Dr. Blakesee's quoted dictum that sensitivity to taste is a characteristic inherited according to the Mendelian Law may set the would-be tasting expert searching among his genealogical records.

* * *

"In the foods laboratory we have two ways of scoring food products. We may measure a definite quality or group of qualities in a product; for example, we may determine the effect of baking temperature on the volume and colour of muffins. On the other hand, there are experiments in which we are interested for the moment, not in specific qualities, but in the desirability of the product as a whole. Let us say that the investigator already knows the difference in volume and colour of muffins, but is interested in knowing which product is more desirable. In such a problem we measure our results in terms of consumer preference."

The author discusses the best conditions for judging; the finding of qualified judges; and subjective and objective methods of judging.

A useful chapter, comprising an introduction to the fundamentals of statistics by Alice E. Ebersold, is interpolated, and should stimulate those who may wish further to investigate those things which are proverbially reputed to prove anything.

Then we come to "the fundamental concepts of colloids"—a valiant effort to explain a relatively abstruse subject in five pages.

* * *

Another part of the book treats of specific products—jellies; foams, which include omelets, soufflés, meringues, and so on. Batters and doughs occupy considerable space; fruits and vegetables and meat cookery all have their place. Quite a lot of theory is deftly tucked away among practical considerations. For instance, the chemical formulæ showing the hydrolysis reaction of a fat is contained in the doughnut section. This need not affright the unscientific reader. The chemistry may, if need be, be skipped and the practical part absorbed, and the said reader will still get value for his money.

There are some odds and ends of tables at the end, including the old familiar Fahrenheit-Centigrade conversion table, the main one being weight-volume measurements of foods, showing, for instance, that one cup of butter weighs 224·0 grams, which is of the nature of a sop from the laboratory to the kitchen. Incidentally, I have often tried to verify these measurements, and have come to the conclusion that my cups and teaspoons must be abnormal as I never seem to get the weights right.

A really interesting little book for food students, manufacturers, with a useful bibliography almost entirely confined to the American literature. In the second edition of the book the author may, with profit, make the bibliography a little more wide, even though she has visualised as her public solely the American student, and here I suggest again that she may be making a mistake.

T. C.-W.

* *Introduction to Experimental Cookery. Edith H. Nason, Ph.D. Pp.* 317 + vii. 18*s. net.*

THE PRODUCTION AND DISTRIBUTION OF MILK

To those manufacturers who use milk and are interested in their raw materials, this article will appeal.

C. A. WILSON, M.S.I.A., A.R.San.I.

THE first Dairies, Cowsheds and Milk Shops Order was made in 1879, followed by the Orders of 1885, 1886 and 1899, which were made under section 34 of the Contagious Diseases (Animals) Act, 1878, and, under the Order, district councils made regulations which provided for, briefly, the inspection of cattle and dairies, the proper lighting, ventilation, cleansing, drainage and water supply of cowsheds and dairies, the cleansing of milk vessels, and the prevention of contamination or infection of milk.

Following these regulations came the Infectious Disease (Prevention) Act, 1890, the Public Health (Amendment) Act, 1907, the Milk and Dairies (Consolidation) Act, 1915 (which came into force in 1925), the Milk and Dairies (Amendment) Act, 1922, the Milk (Special Designations) Order, 1923, the Public Health (Prevention of Tuberculosis) Regulations, 1925, the Milk and Dairies Order, 1926, the Milk Act, 1934, the Milk (Special Designations) Orders, 1936 and 1938, and many other Orders and Regulations controlling milk and milk products.

It would appear that we are not lacking in legislation to deal with the milk industry generally, but, in spite of the fact that for exactly sixty years the production of milk in this country has been subject to a certain amount of statutory control, some of the milk being marketed to-day is not of good hygienic quality.

Responsibilities of Authorities and Individuals

Many authorities and individuals have responsibilities in the production and distribution of milk, viz.—the Ministry of Health, the Ministry of Agriculture and Fisheries, the Milk Marketing Board, the County Council, the Borough Council, Urban and Rural District Councils, the Producer, the Milker, the Distributor (Wholesale), the Distributor (Retail) and the Consumer. These responsibilities can be allocated briefly as follows:

(*a*) The Ministry of Health.—The making of Orders and Regulations and the general supervision of all local authorities with statutory obligations under the various Acts, Orders and Regulations.

(*b*) The Ministry of Agriculture and Fisheries.—The routine inspections, examinations and tests by veterinary inspectors of dairy cattle, and the Veterinary Functions of the Tuberculosis Order, 1925.

(*c*) The Milk Marketing Board.—The disposal of all milk produced, and the fixing of prices payable to the producer and by the consumer.

(*d*) The County Council.—The granting of licences under the Milk (Special Designations) Orders, 1936 and 1938 (Tuberculin Tested and Accredited).

(*e*) The Borough, Urban and Rural District Councils.—The registration of all producers and distributors, the enforcing of the legal standards of the Milk and Dairies Order, and the issue of licences under the Milk (Special Designations) Orders (bottling establishments not on the farm, pasteurising establishments and supplementary licences).

(*f*) The Producer.—He is the person in the milk trade with the greatest responsibilities. These have been brought home to him very fully during recent years and are summarised as follows:

(i) The selection of dairy cows intended for the production of milk.—Such animals must be from good, healthy stock of a breed suitable to the particular district, healthy, quiet, and capable of giving the amount of milk required to provide an economic return on the capital outlay. There is a tendency these days to convert the dairy cow into a milk-producing machine. Though this may prove very profitable for a time, I feel that it must have a detrimental effect upon the constitution of the animal.

(ii) The immediate recognition of symptoms of disease amongst cattle in the herd.—There are statutory requirements in regard to the notification of certain diseases.

(iii) The selection of food for the animal.—This requires careful management, and careful supervision is essential to maintain a satisfactory milk yield. Certain types of feeding-stuffs will, if improperly fed, produce a milk taint.

(iv) The housing of dairy cattle.—The cowshed should be properly sited having regard to the lay-out, aspect and approach, cubic space, standings, walks, lighting, ventilation, water supply, drainage and manure disposal. All these points should be carefully considered before construction or reconstruction of cowsheds is commenced.

Difficulties sometimes arise in connection with the structural condition of cowsheds when the producer is not the owner of the premises.

Milking Methods

(v) The method of milking and the selection of Milkers.—The producer must decide whether to adopt machine- or hand-milking methods. Where the herd is large and there is a shortage of labour, machine milking is usually the method adopted. For the smaller herds, however, hand milking is still the general practice.

The reference to the selection of milkers is probably misleading, as few producers have any choice in the matter, having to take any available skilled worker.

(vi) Precautionary measures in the cowshed necessary for the production of clean milk.—Facilities must be provided for readily cleansing the cowshed, the cows, utensils and other equipment, together with washing facilities for the milkers.

(vii) Water supply for animals, cowsheds and dairies.—This is a primary feature of clean milk production, as lack of adequate water supply often prevents a producer getting on the accredited roll. It is desirable that water should be laid on under pressure to enable the floors and walls to be properly washed down.

The extension of public water supplied by local authorities is therefore an important factor in clean milk production.

(viii) Cleansing of utensils.—For this purpose, cold water, boiling water and, if possible, steam, should be available, but even with the best possible facilities the cleansing of utensils requires most careful supervision, to obtain satisfactory results.

(ix) Cooling, storage and general care of milk.—The dairy should be clean, cool, light, well ventilated and free from dust. Immediately after milking, the milk should be conveyed to the dairy, there cooled to the lowest possible temperature, and stored in closed churns in a cool place until it leaves the possession of the producer.

(x) The keeping of records and accounts.—This is a requirement of the Milk Marketing Board, and is of great value to the producer.

(xi) Compliance with the statutory requirements of all the authorities, and to produce milk of the legal standard.—In addition, where a licence is held under the Milk (Special Designations) Order, to comply with the conditions of such licence.

(*g*) The Milker.—The milker has important responsibilities, including the cleanliness of the cowshed, of the animal, of the milk vessels and of his person. He is also required to notify his employer if he or any of his family is suffering from an infectious disease.

(*h*) Distributors (Wholesale).—Distributors in many cases arrange for the collection of milk at the farm, and the supply of milk vessels, and are responsible for the transport and storage of milk under proper hygienic conditions, also for the proper cleansing of milk vessels.

Wholesale distributors who undertake the treatment of milk at their receiving depots, must obtain a licence if it is to be sold as pasteurised milk. Their business premises must be registered and kept in accordance with the requirements of the local authority.

(*i*) Distributors (Retail).—They obtain their milk either direct from the farm or from a receiving depot, and in many cases bottle their own milk. Where such milk is to be sold as a graded milk, a bottling licence is necessary.

Here, again, the proper storage and cleanliness of premises and utensils is the essential factor.

Premises where business is carried on must be registered.

(*j*) The Consumer.—He is responsible for the proper storage of milk in the home and the cleansing of milk utensils.

Results Obtained

A survey of the reaction of the authorities and individuals to their responsibilities justifies a brief examination.

(*a*) The Ministry of Health has produced some very effective Orders relating to milk production and distribution, but has entirely overlooked the provision of adequate personnel for the enforcement of such Orders. As an example, in the county of Somerset, in the rural districts alone there are 6,654 milk producers and 33 sanitary and assistant sanitary inspectors (six or seven years ago the number of inspectors was 50 per cent. less). This means an average of over 200 producers to each inspector. Is it possible that they can give the necessary supervision to the milk supply, and enforce all the articles of the Milk and Dairies Orders? It is obvious that it cannot be done, when one considers all the other duties they have to carry out. This is a point which the Association has stressed on many occasions, and one which we must at every suitable opportunity continue to bring to the notice of the Ministry of Health.

(*b*) The Ministry of Agriculture and Fisheries has only recently taken over the inspection of dairy cattle and therefore any comments at the present time would not be justified.

(*c*) The Milk Marketing Board has undoubtedly made a considerable success of its gigantic undertaking. Since the Board came into being, the production and sale of liquid milk has increased considerably. Prices both to the producer and the consumer have been stabilised, and a very important point in its favour is that the producer has a guaranteed market for his milk. The Board has had its troubles with certain classes of distributors, but these are minor matters when one considers the vast extent of the undertaking.

Lack of Uniformity

(*d*) The county councils, as the responsible authorities, grant licences to producers under the Milk (Special Designations) Orders. They have been subjected to a considerable amount of criticism on the question of lack of uniformity, in various counties, of the standards required to qualify for such licences. I think much of the criticism is justified, and this lack of uniformity is to be deplored, as it is grossly unfair to the producer when only a county boundary stands between him and an accredited licence.

The appointment of County Sanitary Inspectors for the duties of inspection and report on the suitability of premises and plant prior to the issue of licences will do much to obtain the uniformity of standards which we all so keenly desire.

(*e*) The borough councils, urban and rural district councils have done and are doing much to bring about that marked improvement which has been effected during the last few years in the milk supply of this country. They have obtained the confidence and co-operation of

the producers. The Sanitary Inspector of these days is welcomed as a helpful visitor at the farm.

The local authorities generally are eager to do all in their power to improve the supervision necessary for the production of clean milk, but high rates are always a bar to the appointment of additional inspectors for this purpose. It was only after these authorities had done so much in the field of clean milk production that other authorities became interested in the matter.

The Producer

(*f*) The producer is a person in a highly skilled occupation and, with few exceptions, is intelligent enough to realise his responsibilities in milk production, and to make every endeavour to improve his herd, cowsheds and methods.

The producer in a small way of business usually produces milk of a high standard, but as a general rule is unable to obtain the advantage of the increased price paid for accredited milk as in most cases he is unable to bear the cost of additional equipment and plant required to qualify for such licence. Again, he may not be the owner of the premises which require structural alterations necessary before a licence can be obtained.

Whilst it is admitted that there are still a few unsatisfactory producers, it is very unfortunate that their milk should be bulked with graded milk. This leads to dissatisfaction and loss of interest on the part of the better type of producer.

Many people are under the impression that milk other than "Graded" milk is of a very low standard. This is a fallacy, as, in fact, the bulk of the ungraded milk produced in this country is equal to accredited standard.

(*g*) The milkers as a whole take their responsibilities seriously, but it is a regrettable fact that many of the better type are leaving the industry, and in the near future I am afraid it will be difficult to obtain a sufficient number to meet the requirements of the producers.

(*h*) Wholesale distribution is a highly organised business requiring up-to-date plant and first-class management, and as a rule the manner in which the business is carried out and the condition of the premises leaves little to criticise, except perhaps in the collection of milk from the farms. Milk is often left on platforms for hours exposed to the sun and transported in hot weather without being covered.

Before the advent of the Milk Marketing Board, I think the large distributors missed an opportunity of improving the milk supply, by not refusing to put on the market dirty milk obtained from unsatisfactory producers.

Retail Distribution

(*i*) The retail distribution of milk is not well organised, and there must be more overlapping of delivery than in any other retail trade. The delivery of milk in bottles has increased considerably in recent years, and I hope the time is not far distant when all milk will be delivered in properly sealed bottles.

The advertisements on retail vans should be the subject of control, as some of the extravagant claims and statements for milk from a particular dairy which can be seen every day are in my opinion detrimental to the milk trade as a whole. There is still much to be done to improve the retail distribution of milk.

(*j*) The consumer is drinking more milk but still requires education in the proper storage of liquid milk in the home. A cool store and clean utensils will extend the period milk can be kept in good condition, and is therefore economy on the part of the consumer. The care of milk bottles is a moral responsibility of the consumer. These should be rinsed with cold water when emptied and placed on the doorstep just before the roundsman is expected, thus avoiding the risk of contamination by dust or by being rolled in the gutter.

Future Milk Standards

Much has been accomplished to improve the production and distribution of milk, but we still have a long way to go before we can honestly say that we are satisfied.

The Milk (Special Designations) Orders have shown what can be done in this direction, but only deal with the matter piecemeal. A uniformly high standard is the only satisfactory and justifiable policy, and to penalise the unsatisfactory producers is the only way to obtain such a standard.

Our goal must be one grade of milk only for liquid consumption, and that grade to equal the bacteriological and chemical standard of tuberculin tested. To achieve such a standard will require the combined efforts (based on practical and scientific principles) of all the authorities and individuals concerned.

The first necessity is a compulsory bacteriological standard for all milk. This naturally would involve the periodical sampling and examination of the milk of every producer, and should such milk fail to pass two consecutive tests it should not be allowed access to the liquid-milk market, until the authorities were satisfied that such milk had been brought up to standard. Meanwhile the milk should be diverted for manufacturing purposes and the cost of cleansing and sterilising would be made a charge upon the producer.

Secondly, the segregation of all dairy cows reacting to the tuberculin test is essential. Whilst it is realised that the immediate slaughter of all such animals would dislocate the milk supply of this country to an impossible extent, the milk from such animals should be utilised solely for manufacturing purposes, where the processing includes sterilisation.

Thirdly, the complete eradication of tuberculous dairy cows is a matter which the Ministry of Health, in conjunction with the Ministry of Agriculture and Fisheries, should deal with promptly and efficiently. It has been stated on good authority that 40 per cent. of the dairy cattle in this country are affected with tuberculosis.

Tuberculosis Order

Fourteen years ago the Tuberculosis Order was introduced, followed a year later by the Milk and Dairies Order. Both dealt with the question of tuberculosis in dairy cows, and what is the position to-day? Has the

number of affected cows been reduced? Has the number of cows giving milk affected with tubercle bacilli been reduced? These questions I leave to the advocates of pasteurisation, who will no doubt convince you that the answers are in the negative.

A bold policy is required and the Ministers concerned should be pressed for a definite ten-year programme which would provide for the elimination of every known tubercular cow from the milk-producing herds. Such a policy would not only have to be bold but drastic; nevertheless it would eventually be of great benefit to both the producer and the consumer. The cost would be heavy, but the results obtained would be of such value as to justify the expenditure.

Although much has been done in the last few years, much more will have to be accomplished in the future. We must have a definite milk standard and complete eradication of tubercular dairy cows before we can assure the public that the milk supply of this country is safe and of a quality beyond reproach.

(*A paper which was to be read at the Bournemouth Conference last September* [*concelled*] *of the Sanitary Inspectors Association.*)

The Vitamin A Value of Preserved Olives

DIETARY experiments on rats were carried out by A. Famiani, who used both green and black olives as additions to a vitamin A-free diet. The green olives (from the province of Foggia) were first dipped in 2 to 2·5 per cent. caustic soda and well washed before brining, while the black variety (from the province of Frosinone or Littoria) were kept in water for 50 to 60 days before brining.

Albino rats were divided into 4 groups: The first were fed on an exclusively vitamin A-free diet, the second and third on the same diet with addition of olives and butter respectively, and the fourth on an ordinary mixed diet. Rats in the group receiving black or green pickled olives exhibited a growth curve equivalent to that in the butter group and in the mixed-diet group. But the rats fed exclusively on a vitamin A-free diet grew only to a limited extent, and all of them eventually died after progressively losing weight. The author concludes that brined olives contain a not inconsiderable amount of vitamin A.

Nitrogen-Free Extract in Feeding Stuffs

THE present scheme of evaluating feeding stuffs according to their content of crude fat, crude protein, crude fibre, ash, and nitrogen-free extract (undetermined organic matter) was introduced by Henneberg in 1860 to take the place of the older system of hay equivalents. While this was a great improvement over the previous scheme, it has long been recognised that nitrogen-free extract is a complex of polysaccharides, hemicelluloses, lignin, pectin, uronic acids, and other components which differ in nutritive value. Developments of the past quarter century have thrown much light upon the nature of these nitrogen-free extract components, although the processes for their determination give only approximate results. Moreover, because of the complicated and time-consuming character of some of these determinations it is probably inadvisable at present to make any extensive changes in the old Henneberg scheme for the ordinary routine work of feeding-stuff analysis. But for the more exact purposes of research, use should be made of the latest improved methods for determining the various constituents that have been grouped so long and so loosely under the misleading term, nitrogen-free extract. This was the subject of a paper read before the American Chemical Society by C. A. Browne.

Food Contamination by Gas

THERE is little danger of large-scale food contamination by gas attack, according to Dr. A. P. B. Page, of the Entomological Research Station of Imperial College, Slough, when addressing a conference of the Food Group of the Society of Chemical Industry in London.

Dealing with the four gases which, he said, would be most likely to be encountered in war-time, Dr. Page said that, in the case of phosgene, fresh food having a high water content would be most affected and dried foods least. The gas was absorbed also by certain fatty foods, and such products should be particularly closely examined after decontamination. Since wax was absorbed by the liquid and by other war liquids, parchment paper might be better for wrapping than waxed paper. Rubber was attacked by phosgene, but the common metals only by moisture.

Chloropicrin also was most likely to be absorbed by fatty foods, and, owing to its weight, had a tendency to concentrate particularly near the ground. It was very readily removable from most materials by ventilation.

Dichloroethyl sulphide was a vapour about five and a half times as heavy as air and was extremely persistent. In common with most vapours, it penetrated textiles and porous materials, and in the liquid state also penetrated among wrapping materials such as paper and wax, but not a continuous film of oil paint. It was possible, said Dr. Page, that food contaminated with liquid would be useless, but that the vapour might be successfully decontaminated by ventilation. Here, again, special care would be necessary in foods containing fat.

Diphenyl chloroarsine would have to be very finely dispersed in the air before it would be effective, and in certain states would penetrate between the threads of fabrics, but was stopped by a few wrappings of paper. Whilst it seems almost impossible to remove contamination of this kind, many of the standard wrappings would prevent its occurrence.

In conclusion, Dr. Page said methods are available for the detection and determination of all the known war gases. It seems likely that many foodstuffs could be well protected against such gases. It should be possible to decontaminate most foodstuffs affected by vapours, but relatively few affected by liquids. Contamination is likely to be severe only on the surface of piles. Thus big piles of foodstuffs would be less affected than small piles.

Another Way With Rabbits

AN account was recently given of how Berkshire is tackling its rabbit problem, and now Hampshire is getting to work.

The County Committee have drawn up a list of 140 expert rabbit-catchers who are prepared to work on terms that the Committee lay down. When cases of rabbit damage are reported, particularly to young growing wheat, the occupier of the adjoining woods or land where the rabbits are numerous is requested to take steps to reduce their numbers.

These notices are promptly followed up, and if the Committee is not satisfied that the action taken is effective some of the official rabbit-catchers will be put in to do the work on the Committee's behalf.

NEWS FROM THE INDUSTRY

PLANT AND EQUIPMENT

Steam Trap News

The first thing taught to every budding journalist is the proper assessment of the value of news. It's an old Fleet Street maxim that when a dog bites a man it isn't news, but when a man bites a dog—well, that's *news*!

Apply this logic to the subject of prices. Increase in prices on account of the war no longer constitutes news, but when we hear of somebody still maintaining pre-war prices, then surely this *is* news.

Messrs. Spirax Manufacturing Co., Ltd., manufacturers of Spirax Steam Traps and Strainers, inform us that their prices have not been increased; in other words, their pre-war prices remain unchanged.

It is pointed out that as soon as war started the largely increased demand for Spirax Traps (by industrial concerns as well as by all Government Departments) pretty well doubled normal production, big as it was. The resulting decrease in overheads has provided for the extra cost of raw materials, insurance, and so on.

We understand that if the present demand for Spirax is maintained the prices will remain unchanged.

* * *

An Homogeniser

Much has been done in recent years in the direction of developing homogenising machines, the function of which is well understood by those engaged in the milk industry. By refinements in manufacture and improved knowledge of the various changes which take place in foods treated by the process, a degree of efficiency has now been reached which it is difficult to suppose can be exceeded, and this development is all the more to be commended at the present time when certain substitutes in manufactured goods are necessary as a result of prevailing conditions.

The effect of the war, for example, on the ice-cream industry has been that butter or cream is no longer available for use in ice-cream, and manufacturers are compelled to make use of substitute fats. Good homogenisation more than offsets this, and the Brush Electrical Engineering Co., Ltd., have contributed usefully to the improvement of the process. For a long time they have been making a homogeniser capable of handling quantities up to 1,000 gallons an hour, and during the past few months they have extended the application of their machines by the acquisition of the manufacturing and selling rights of the Impulsor Emulsifier. This machine is capable of handling small quantities from 8 to 12 gallons an hour, bringing the homogenisation process within comparatively easy reach of the smaller producers of food.

* * *

Short-Time Pasteurisation

There are far-reaching changes in the dairy industry brought about by the outbreak of war. Migration of town dwellers on a large scale, sudden fluctuations in the supply and demand for milk, alteration in the times and regularities of deliveries have made it impracticable, in some cases, to carry on pasteurisation in rigid compliance with the existing regulations in Great Britain. It is of vital importance that any departure from standard practice which dairymen may find themselves forced to adopt should be such as will not endanger the well-being of those who rely on them for a sound and health-bringing food.

The Aluminium Plant and Vessel Co., Ltd., have issued a booklet, "High-Temperature Short-Time Pasteurisation", which includes a revised description of a method of pasteurisation which, although it does not come within the scope of the regulations laid down by administrative order, is widely used throughout the world and would, it is claimed, if conscientiously applied with suitable equipment, ensure the safety of war-time milk supply.

* * *

War Against Waste

Sir John Simon said, "While we are waging war against the enemy abroad, let us also wage war against waste at home." In this respect food manufacturers are undoubtedly searching for means to avoid wasteful expenditure, and they, in common with other industrialists, must view the increasing prices of coal with anxiety. With their characteristic thoroughness, however, the food people will always listen to proposals offering a good return on capital outlay. As the emission of black smoke from their factory chimneys is a sign of a decided waste of fuel, it is not surprising that many are replacing the old-fashioned hand-fired methods in the boiler-house by the highly economical mechanical stokers.

Many firms whose names are household words in widely differing sections of the food industry have installed mechanical stokers made by the Bennis Combustion, Ltd.

The illustration below shows a typical installation.

PLANT AND EQUIPMENT

Diamond Jubilee

The present year is the diamond jubilee of W. H. Allen, Sons and Co., Ltd., and in their latest *Review*, which is issued quarterly, they say that, although under present conditions a large proportion of their production is for national requirements, every effort is being made to maintain, during war-time, their connections with markets at home and overseas.

Among some very interesting articles devoted to engineering in the *Review* is one on steam pipes. In the old days of steam engines and the other turbine designs, the prime mover was very massive compared with the pipes connected to it, and if there were any forces due to pipe expansions the deflection all had to be in the pipe line, as nothing short of an earthquake could change the position of the prime mover.

The advent of the high-speed turbine, however, has led to the reduction of the weight of the turbine in proportion to its power.

The steam consumption of a back-pressure turbine is necessarily high, so that its steam pipe may easily be half the diameter of the turbine rotor and the exhaust pipe may have a diameter actually larger than the rotor itself. It becomes clear that, unless care is taken in the design of steam and exhaust pipe ranges, thrusts coming back on the turbine casing may easily cause such distortion that rubbing may occur between the stationary and rotating portions.

This article proves the paramount importance of careful attention to expansion effects not only within the turbine but also as regards the design, supporting and anchorage of the steam and exhaust mains.

* * *

Pulley-Blocks

The purpose of a good pulley-block is to yield a maximum of lift in return for human effort. That this object is achieved through the use of a machine-cut worm and worm-wheel of just the right pitch angle and tooth profile to give the highest mechanical efficiency is claimed by Herbert Morris, Ltd., for their pulley-blocks.

The gears are housed in a rigid steel frame to ensure continuous alignment. Their motion is so easy that a load on the bottom-block would set them rotating. So a one-way automatic brake is fitted. This allows free rotation in lifting, but creates just enough resistance in lowering to keep the load in balance. The brake resistance is at all times proportional to the load on the hook.

If a pulley-block is to operate smoothly, there must be perfect meshing of the loadchain with the loadwheel. The pockets of a Morris loadwheel are accurately moulded to receive a chain which is a series of precisely formed links. Every piece of chain is carefully examined and checked for pitch. The combination of chain and wheel is therefore a mechanism which will lift loads without jerk or slip.

* * *

Temperature Regulation

The expansion of liquid forms the principle of operation of the Sarco Temperature Regulators.

The liquid is sealed within the thermostatic system by means of Sarco Spiral Bellows tubing which forms at the same time, a frictionless leak-proof gland for the plunger operating the valve.

There are several advantages of this system. It dispenses with any outside source of power for the operation of the control, it is entirely self-acting and therefore continues to function at times of electric current failure. It exercises a gradual or metering control, allowing just the amount of heating or cooling medium to pass, which will maintain the set temperature. It affords the same ample hydraulic power for positive valve operation at low as well as high temperature—in other words, the power generated per degree temperature rise is the same over the whole temperature scale. Most important of all from the maintenance engineers' point of view, there are no packed glands on the valves.

These regulators, made by Sarco Thermostats, Ltd., find application wherever steam or hot water is used for heating, or brine or water for cooling purposes. The Sarco Blender incorporates a thermostat and three-way valve in a compact unit, for fitting directly into the pipeline. It is used for blending hot and cold liquids and delivering the mixture at a controlled temperature, or as a by-pass valve on cooling circuits.

The purpose for which these simple controls have been used in the food industry are extremely varied, and cover exhauster boxes for canned foods, pasteurisers for milk and beer, bottle-washing machines, grain drying and conditioning plant, drying ovens, confectionery pans, ham-cooking retorts, process tanks, stock rooms, etc.

Mixing Valves

For various applications in the food and general confectionery industries, including, for example, toffee manufacture and the washing of bottles, jars, and containers, a great advance is represented by the "Leonard-Thermostatic" water-mixing valve, which enables a supply of warm water to be maintained continuously at any desired temperature, within, say, 2° F., by mixing hot and cold water supplies that may vary greatly in pressure and temperature.

The valve is a production of Walker, Crosweller and Co., Ltd., and is supplied in two general types, "T" with three sizes and "R" with two sizes, according to the capacity.

The mixing chamber contains two heavy but very sensitive close coils, which in the "R45" valve, for example, are each formed of bi-metal strip, which, if stretched and joined together, give a very powerful double effect. It is well known that a bi-metal coil, formed of two metals of greatly different co-efficients of expansion, in this case non-corrodible stainless steel alloys, possesses a relatively pronounced movement for a small temperature change, and this, by means of a driving pin, actuates the rotary valve in the base plug adjusting the inlets of the cold and the hot water. The control handle to alter the desired temperature range operates by moving the thermostat and the rotary valve to a new base position in relation to the ports. The smaller "T" water-mixing valves have only one bi-metal coil and a different type of slide valve.

* * *

Gear Drives and Worm Reducers

The design and manufacture of gear units to meet the severe duties of rolling mills and similar applications call for specialised experience accumulated over a great many years by carefully studying the actual conditions under which such gears operate. David Brown and Sons (Hudd.), Ltd., manufacture a "David Brown" heavy type gear unit—both single and double reduction—designed to give long and dependable service without risk of breakdown while requiring a minimum of attention.

They also manufacture a Radicon worm reducer, a fan-cooled unit, which they claim provides reliable, silent and exceptionally compact drive for horizontal shafts at right angles, and is suitable for a very wide range of applications.

COMPANY MEETING

Liebig's Extract of Meat Company, Limited

Presiding at the seventy-fifth ordinary general meeting of Liebig's Extract of Meat Company, Ltd., on February 15, Mr. Kenneth M. Carlisle, the Chairman and Managing Director, said that a certain part of the appreciable increase in turnover during the current year was attributable to the recommendation of the authorities before the outbreak of war in regard to the advisability of stocking domestic storecupboards. The company's products, Oxo in cubes and bottles, Beefex, Fray Bentos Corned Beef, and other canned meats, readily lend themselves as useful adjuncts to the store-cupboard. However, sales had continued to be satisfactory throughout the year and no adverse effects of any wise anticipation on the part of the consumer in laying in stocks against the possibility of war had ensued; indeed, the reverse had been proved to be the case, and the association company has a big task to meet demands for all products.

Commenting on the position in the River Plate, Mr. Carlisle said that the promise of a prosperous year in the farming section was offset by unfavourable conditions during the winter months—at the very end of the accounting period—which adversely influenced physical and financial results. The very liberal subsidy, however, granted by the Argentine Government in Argentina on slaughter bullocks conforming to certain standards and weights, provided they were sold to third parties and not to their own establishments, helped materially to compensate for the poorer turnover. The factories at Colon and Zeballos Cue were operated to capacity during the season, and here again the handsome subsidy granted to cattle ranchers on their slaughter stock was helpful because the economic value of cattle, based on the market prices of products and by-products, was very much below the ideas entertained by stock raisers, who already during previous years had had a higher range of prices secured for them by means of Government assistance or intervention.

CHANGE OF ADDRESS

Owing to the continual expansion of business, the C. L. Burdick Manufacturing Co., Ltd., is removing to larger premises situated at 6-8, Amwell Street, Finsbury, London, E.C. 1. Telephone, Terminus 7123-4. The factory and office will be at the new address from February 26, 1940.

WAR-TIME MATTERS

Committee on War-time Problems of Nutrition

The following have accepted membership of the Committee on War-time Problems of Nutrition appointed by the British Medical Association: Professor V. H. Mottram, M.A., Professor of Physiology in the University of London; King's College of Household and Social Science. Professor E. P. Cathcart, C.B.E., M.D., F.R.S., Regius Professor of Physiology, Glasgow University. Professor S. J. Cowell, F.R.C.P., Professor of Dietetics in the University of London. D. J. H. Harley Williams, National Association for the Prevention of Tuberculosis; Central Council for Health Education. Dr. Maitland Radford, Medical Officer of Health for St. Pancras; Central Council for Health Education. Sir Kaye Le Fleming, late Chairman of Council, B.M.A.; general practitioner in Wimborne. Dr. Wilfred J. Pearson, D.S.O., M.C., F.R.C.P., Children's Diseases; Physician-in-charge, Children's Department, University College Hospital; Physician, Hospital for Sick Children, Great Ormond Street. Dr. J. C. Spence, M.C., F.R.C.P., Physician, Newcastle.

* * *

Tinned Beef Proposal

The Axminster Branch of the N.F.U. unanimously carried a resolution, at the instance of Mr. Abe Newbery, urging the Ministry of Food to set up machinery to deal with barreners and other cattle which do not at present come in the control grading, and that such beasts be paid for at their value.

Mr. Newbery said that formerly such cattle had been sold and sent away into industrial areas, for sausages and similar use. Much of this beef could be turned to supply a big demand in the North.

* * *

War Savings

"The campaign for National Savings by the purchase of Savings Certificates and Defence Bonds has made an excellent start," said the Prime Minister, speaking recently at the Mansion House.

Employers have a particular importance in the War Savings campaign. They, more than anyone else, can influence formation of National Savings Groups among wage-earners. Representatives of nearly every industry and trade in the country have joined enthusiastically in the organising of Groups—firms with as many as thirty thousand employees, and small firms with as few as ten or twenty members. Three-quarters of the 6,000 Groups formed so far are in places of employment. The rest remain as a challenge of opportunity to the whole movement.

The journal *War Savings* which succeeds its forerunner *National Savings*—comes into existence to be a link between all persons and all districts of the National Savings Movement. Vol. I, No. 1 of *War Savings* has just been published.

* * *

Food Rationing: Special Diets

The Medical Research Council has been requested by the Ministry of Food, the Ministry of Health, and the Department of Health for Scotland to appoint an expert committee "to advise from time to time on the question whether it is necessary on medical grounds to modify or supplement rations in the case of invalids and other persons on special diets", and the following have accepted the Council's invitation to serve: Sir Edward Mallanby (Chairman); Professor L. S. P. Davidson, University of Edinburgh; Viscount Dawson of Penn; Professor F. R. Fraser, British Postgraduate Medical School, London; Professor H. P. Himswort, University College Hospital, London; D. R. D. Lawrence, King's College Hospital, London; Dr. R. A. McCance, University of Cambridge; D. J. C. Spence, Victoria Infirmary, Newcastle-upon-Tyne. The committee will hold its first meeting at once, when the question of diabetic diets will be particularly considered. The recommendations will be transmitted by the Medical Research Council to the Departments concerned.

FOR MANUFACTURERS

"How's Life"

A booklet prepared with the object of being some help to manufacturers of nationally marketed products has been published recently under the name "How's Life," by Lord and Thomas, Ltd. It attempts to deal with certain aspects of the impact of war on the man in the street—his job, his new cost of living and some of his personal opinions. Although the statistical basis for some of the statements made is necessarily somewhat restricted, the figures will probably be of interest, especially at a time when Government figures and informed opinions are not always available.

INFORMATION AND ADVICE

Canned Fruits and Vegetables—Orange and Banana Curd—Apple Crisps—Sugar from Coconuts—Ice-Cream Powder—Gum

Canned Fruits and Vegetables

6,060. *We shall be very much obliged if you can supply us with particulars relating to the comparative food values of canned fruits and canned vegetables.*

We are aware that papers have been written and articles published on this particular subject in recent years and we shall be greatly obliged for any assistance you can render us.

Food Industries Manual, in the section on "Composition of Foods," gives tables in full detail, and comparison may be made from these.

A very recent book that we can recommend is *Fruit and Vegetable Juices*, by Tressler, Joslyn and Marsh, and in it is contained a table on the composition of fruits and vegetables used for juice—giving protein-content, carbohydrate, acid, calories and vitamin. We can secure a copy of this work for you from America at approximately 30s.

We would also recommend a set of tables on the vitamin values of foods published in Vol. 7, part 4, of Nutrition Abstracts and Reviews. This set is now published separately and is available at 2s. 6d., plus postage. The tables have been collected by two experienced workers in the field of nutrition from the vast literature on the subject that has been published in recent years.

Orange and Banana Curd

6,030. *Can you supply us with a formula for a commercial orange curd and banana curd, as used by bakers and generally packed in 7 lb. tins?*

The following is a basic recipe for lemon curd:

Water	4 qts.
Cornflour	1¼ lb.
Flour	1 ,,
Rice flour	2 oz.
Lump sugar	10 lb.
Unsalted margarine	2 ,,
Eggs	6
Leaf gelatin	¼ lb.
Glucose	6 ,,
Butter essence	1 oz.
Egg yellow powder	⅛ ,,
Oil of lemon	2 ,,
Tartaric acid	2 ,,

Soak the gelatin in cold water for 1 hour. Boil the egg colour in 1 gill water. Dissolve the tartaric acid in 1 gill water. Mix the sifted flour, cornflour and rice flour in 3¾ quarts of water, and pass this mixture through a hair sieve into a copper bowl. Add the sugar, margarine and eggs to this, and beat up gently until boiling, stirring it well to prevent it from burning. After boiling for a few minutes add the gelatin, which should have been drained free from surplus water. Mix this gelatin well in and continue the boiling. Then add the glucose and bring again to the boil. Now the butter essence is mixed in, then the prepared egg yellow colour and oil of lemon. When all these ingredients are well amalgamated into the batch, take it from the fire and add the tartaric acid solution. Stir this well in and leave the mixing to cool (slightly stirring it occasionally) before transferring it to sterile jars. This mixing makes about 30 lb. of lemon curd. Care should be taken to follow the method as set out here and to stir well from the bottom to prevent burning if you have no steam boiler. Watch that it does not flow over the top of the bowl when the gelatin and glucose are added. Total time of boiling not to exceed 15 minutes.

With this recipe in mind an orange curd could be made with oil of orange, and banana curd with a synthetic banana flavouring suitable for curds. The name of the supplier of these last two products was given.

Apple Crisps

6,038. *In your issue of October 6, page 344, you wrote an article on Apple Crisps, the American line which one of your correspondents had seen.*

We have written to a friend of ours in New York, who replies that he has made enquiries in a "number of places in New York, but nobody seems to have heard of them".

If you can give us any further information which we could pass on to our friend in New York so that he could obtain samples, etc., we would be indebted to you.

The apple crisps are marketed under the name of "Appella" by the Appella Corporation, Yakima, Washington State. They were shown to our correspondent by Mr. Nevill Wright, Scientific Liaison Officer of the New Zealand Government at his office at 421, Strand. Mr. Wright is not in this country at the moment, but his deputy, Mr. W. R. Hamilton, may be able to give you further details about this product.

Sugar from Coconuts

6,077. *In* FOOD MANUFACTURE *for December 15 there is an item referring to the production of sugar from coconuts.*

We should be very glad if you could inform us where we can get further information as to this product.

The research into this process is being conducted by the Bombay Government, and therefore it comes under Government jurisdiction. I would suggest that for further information you write to the Director-General of Commercial Information in Calcutta, who will, no doubt, inform you as soon as the process is of commercial value.

Ice-Cream Powder

6,021. *We desire some information which would enable us to manufacture a good ice-cream powder which could be marketed in 4-oz. cartons.*

We are at present successfully making custard powder and jelly crystals. War-time conditions favour the development of local industries. There is a supply of milk here, and we shall be pleased to have information which might lead to developing a dried-milk industry. The manufacture of ice-cream powder would probably be a good line in connection with this.

Such books might well be consulted as *Handbook for Ice-Cream Makers*, by L. J. Hynes; *Ice-Cream Plant and Manufacture*, by R. G. Reid; and *Making of Ice-Cream*, by L. R. M. Feltham.

A very modern form of powder and one which is increasing in popularity is known as the "cold mix" ice-cream powder, in that no heating is required in the preparation of ice-cream from it.

In order to make a batch of 100 lb. of ice-cream powder, the following recipe might be useful:

Sugar, finely milled	70 lb.
Skim-milk powder	17·5 ,,
Filler, say, soya bean flour ..	7·5 ,,
Colloid, say, gum tragacanth ..	5 ,,

A formula for hot-mix ice-cream powder is as follows:

Arrowroot	10 lb.
Powdered gelatin	1¼ ,,
Skim-milk powder	3¾ ,,
Sugar (powder)	15 ,,

Add 6 oz. powder to quart of milk plus 6 to 8 oz. sugar. Heat the milk in a water-jacketed pan to about 90° C. Make the requisite quantity of powder into a thin cream with a little cold milk, and pour slowly into almost boiling bulk milk with vigorous agitation. Continue heating the whole in water-bath for another 10 to 25 minutes until it has finished thickening. Cool and freeze.

With reference to your enquiry about the dried-milk industry, this is, of course, a highly technical business, which cannot be covered in this column. You will find a useful summary of the different processes in FOOD MANUFACTURE, November, 1939, page 358. Firms specialising in the plant for the purpose will willingly help you to select the equipment necessary and tell you the cost of same. (Names given.)

Gum

5,606. *We should be obliged if you could favour us with the address of the manufacturers or distributors of Schisa Gum or Cyprian Gum.* (London.)

We have been advised of the manufacturers of Shisa gum and their name has been given to the enquirer. This gum is made from the seeds of the locust bean, and is sold under various names such as Carob Gum and Luctin, and evidently is not schiraz-gum, as previously suggested.

Egyptian Onions

5,731. *We find that after a time Egyptian onions ferment and go milky. Please let us have a remedy for preventing this. It only occurs in Egyptian onions.*

In our February issue we suggested that you should consult an expert in this matter. We have now received the following suggestions:

These onions require special attention before bottling. First peel them and put them into hogsheads in the usual brine. Let them stand in this one month, when the fermentable matter will have worked off. Wash them off in basket before putting them into pickling vinegar. There will be no trouble if this procedure is carried out.

Liquid Cloud

5,762. *Can you give us a recipe for a "liquid cloud" to add to syrups for cloudy drinks, which will hold in the finished drink and not settle?* (Bradford.)

Further information has been forthcoming as a result of investigation. The usual cloud is derived from squashed fruit and essential oils from citrus fruits. A small quantity of citrus pectin is used by some makers. Also a sufficient quantity of sour milk or milk powder will give the required cloud. This powder can be had from the makers of powdered milks. (Names given.)

Information Supplied

5,660. *We should be glad if you could give us the names of British suppliers of second-hand machines for manufacturing and packing toffee.* (Lisbon.)

Names of various suppliers were given.

5,735. *In the September issue of your paper you include a highly interesting article under the title "Combination Baking Powders", which deals largely with the use of mono-calcium phosphate and sodium aluminium sulphate as acid reactants in the production of carbon dioxide for bakery purposes.*

Having previously noticed references to these materials in American literature, we were sufficiently interested to institute enquiries for samples, but find that neither appears to be readily obtainable in England.

If you can put us in touch with some source of supply, we shall be greatly indebted. (Leicester.)

The names and addresses of several suppliers were given.

5,551. *Would you kindly inform us whether a banana flour is manufactured, and, if so, would you let us have the names and addresses of the manufacturers or agents?* (Lincolnshire.)

Name of manufacturer was given.

5,685. *We are interested in buying equipment necessary for handling the canning of fruit pulp, and should be glad to know of English firms manufacturing such equipment.* (Syria.)

The names and addresses of English manufacturers were given.

RECENT PATENTS

These particulars of new patents of interest to readers have been selected from the "Official Journal of Patents", and are published by permission of the Controller of H.M. Stationery Office. The journal can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C. 2, price 1s. *weekly (annual subscription £2* 10s.).

Abstracts of Recent Specifications

Dry Starch for Blancmanges and Puddings

This invention relates to starch products suitable for the preparation, with cold water and without heating, of blancmanges, puddings, creams, custards and sauces. It is particularly concerned with dry preparations which may contain, besides starch, certain additions, and which, when stirred with cold water, will form suspensions which within a few minutes form jellies which can be cut with a knife and have the consistency, solidity and stability required of a blancmange.

It is well known that green (natural) starch swells in hot water. Potato starch, when treated (boiled) with hot water, forms, after cooling, a tough, stringy, sticky paste, which is not brittle. The same applies to starch from other tubers, such as arrowroot starch. In contradistinction thereto the starches of cereals—for instance, maize starch, wheat starch, rye starch and rice starch—when boiled with water and cooled, are converted into jellies possessing all those properties which are characteristic of blancmange, in that they are stable and elastic and can be cut with a knife, from which they can readily be detached.

Apparently a starch jelly possesses the solidity, stability and elasticity required in a blancmange only if during solidification a kind of skeleton is formed within the gel substance by the non-hydrolysed parts of the starch-granules—*e.g.*, the envelopes of the granules—and supports the hydrolysed part of the gel. While potato starch and other starches of similar constitution show a tendency to swell too far and to be reduced to a shapeless mass, maize starch swells much more slowly and only at higher temperature, and after the swelling process some of the original granular matter, probably the envelopes of the starch granules, forms the elements from which the gel skeleton is being built up. Other cereal starches such as wheat starch and rice starch undergo a similar conversion; they swell readily, but not too far, and starches of this nature, therefore, deserve the name of natural blancmange-forming starches. Rye starch behaves similarly, but it may in some cases impart to the dry preparation an undesirable taste or flavour.

It is possible to produce from natural blancmange-forming starches dry preparations which, when mixed with cold water, solidify to form a blancmange-like jelly. It is surprising that these starches, when converted into such dry preparations, retain their favourable limited swelling capacity, which enables the skeleton mentioned above to be built up.

Such dry preparations can be prepared by first reducing the starch to a paste by gelatinising it in the presence of hot water at a temperature below 100° C., and thereafter drying the paste by a process which leaves its physical structure unchanged, so that the dried product, on taking up water again, will swell, and in swollen condition will be identical with the swollen starch (paste), which was subjected to the drying process. The paste, which, besides the starch and water, may contain additional matter, is finely subdivided and dried in this state of fine subdivision. Preferably the paste is atomised and rapidly dried at a moderately raised temperature.

The reduction of the starch to a paste (pastification) is preferably carried out at a temperature within the range of 73° to 88° C. Within this range of temperatures there exists for each kind of starch an optimum temperature for pastification, at which a paste is obtained resulting in a dry preparation which, when mixed with cold water, forms a blancmange-jelly possessing the optimum solidity and stability. If reduction of a starch is effected at a higher or lower temperature than this optimum temperature, the solidity and stability of the jelly forming the blancmange will as a rule be inferior.

With maize starch the optimum temperature is at or near 78° C.—*i.e.*, somewhat below the temperature at which this starch is completely pastified. With wheat starch the optimum temperature of 88° C. is also the temperature at which complete pastification takes place. The difference between the two cases is due to the fact that wheat starch, being less readily pastified, can only be reduced to a paste by heating it up to the temperature at which complete pastification takes place, and that the danger of too far-reaching swelling and of the loss of the property of forming on solidification a stable jelly does not exist. The temperature best suited for the formation of a satisfactory paste from rice starch is 78° C., similar to maize starch. In all cases the conversion of the starch into a paste must be effected with relatively large quantities of water in order to obtain a sufficiently easily flowing paste or a paste which can at least be fed to an atomiser or spraying device by means of a pump. In the case of maize starch, which requires about the fourfold quantity of water, relative to the weight of the starch, in order to swell completely, a proportion of 6 to 15 parts by weight of the starch per 100 parts by weight of water has been found to be suitable. Higher concentrations of starch may be useful if the paste is fed to the spraying device under increased pressure. For instance, at a concentration of 10 parts starch and 100 parts water a paste is formed, which can easily be fed to a spray-drying device by pumping.

Since it is frequently desirable to add to the dry preparation during manufacture additional substances—for instance, sugar, cocoa, milk, fruit juices and the like—it will in certain cases be recommendable to add these substances to the paste before it is dried. In that case the physical properties of the paste may be changed to such an extent that it may become advisable to operate with a different concentration. Thus, for instance, an addition of milk instead of water will increase, while the addition of cane sugar will reduce, the viscosity of the paste. Other kinds of sugar—for instance, glucose, fructose, and arabinose—act similarly to cane sugar. An addition of non-pastifiable meals—for instance, cocoa meal—renders the paste mixture more supple, thus bringing forth a similar change to a reduction of the viscosity. If additions are made which reduce viscosity, the percentage of starch in the mixture may be increased. On the other hand, if viscosity-raising materials are added, a lower concentration of the starch may be chosen in order that the paste can easily be fed to the drier and atomised therein.

A relatively higher starch concentration must be chosen if fruit juices are mixed with the paste, since this causes a decomposition of the starch during the production of the preparation, and this decomposition will probably continue in the finished dry preparation. Such preparations, therefore, do not possess the practically unlimited stability of those which, besides starch, contain milky substances, cocoa or albumen.

The consistency, moulding and wetting capacity and taste of blancmanges prepared from the dry products according to this invention can be considerably improved by the introduction of a compound developing an inert gas—as, for instance, bicarbonate of soda and tartaric acid—added to the dry preparation. The constituents of a gas-developing mixture may also be admixed separately with different portions of the paste about to be dried. For instance, from 2 to 8 per cent. of such compounds, calculated on the starch, may be added.

515,351. August Adolf Salzburg.

Complete Specifications Open to Public Inspection, etc.

14960. Compagnie Hobart: Machine for cutting up vegetables. May 21, '38.
13029. Corn Products Refining Co.: Production of dextrose. May 24, '38.
15425. Basset, L. P.: Process for the preparation of concentrated coffee essence. May 24, '38.
15776. Oelwerke Noury and Van der Lande Ges.: Production of vitamin F preparations. May 27, '37.